

SIMPLIFIED

Obstetrics

Obstetrics and Gynecology Department
Zagazig University



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Preface

Welcome to this edition of simplified obstetrics, a book for medical students, nursing students as well as those in the early part of their professional careers. This edition reflects the changes in practices that have taken place in obstetrics and implements the guide lines from important scientific bodies as the Royal College of Obstetrics and Gynecology.

Feedback from the medical students had led us to make big modification of the book as some subjects had been expanded while other less relevant topics had been omitted or reduced.

I wish to express my greatest thanks and gratitude to a group of colleagues in the Department of Obstetrics and Gynecology, Zagazig University, at different grades from professors and lectures through very enthusiastic and promising assistant lectures who had spent a lot of their time and efforts to produce this book in its final form. Having done this big effort, they requested their names not to be acknowledged in the book and regarded this contribution as an integral part of their profession and their commitment towards their students.

We hope this book will improve the ability of the medical students to understand the basic subjects of obstetrics as well as the young professionals to get a rapid but a complete review of the subject. We are very happy to receive your comments and feedback that will help us to improve future editions of this book.

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Fertilization, decidua formation and implantation

LEARNING OBJECTIVES:

- To describe briefly the concept of fertilization including hints on ovum and sperm transport and sperm capacitation
- To describe briefly the process of implantation
- To describe briefly the differentiation of the decidua and chorion.

Fertilization

Definition: Union of male and female gamete (sperm and ovum) to form the fertilized egg or the zygote.

Site: Fertilization usually occurs at the ampulla of the fallopian tube within 12-24 hours after ovulation.

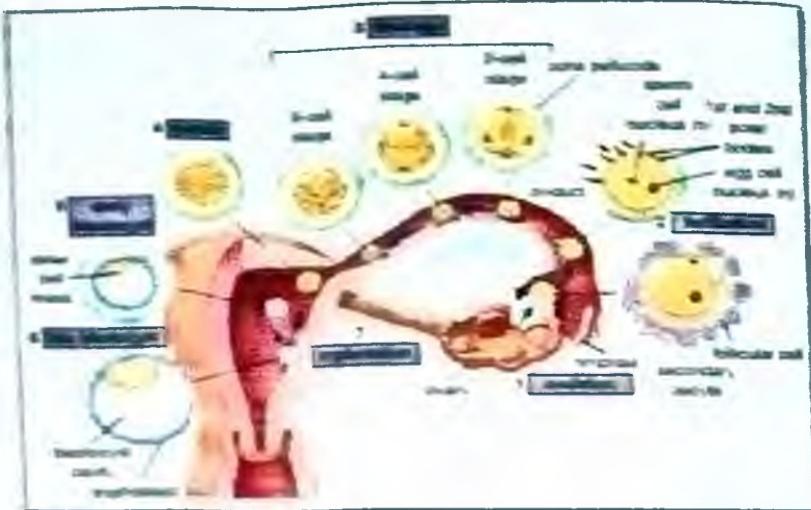
Steps of fertilization:

• Maturation and capacitation:

Morphological and functional changes occur in the sperm in the female genital tract (begins in the cervix and completed in fallopian tube) within 2-6 hours after ejaculation to enable it to penetrate and fertilize the oocyte.

• Ascent of the sperms in the female genital tract:

- At the time of sexual intercourse millions of sperms are deposited in the vagina.
- Some of these sperms travel in the cervix and uterus to reach the Fallopian tube where they swim counterpart.
- Factors helping the ascent of the sperms in the female genital tract:
 - Forward progressive motility of the sperms
 - The cervical mucus penetrability induced by estrogenic effect
 - Uterine contractility stimulated by prostaglandins from uterus and semen
 - Peristaltic movements of the tubes



- Unions of sperm and ovum

- The sperms reach around the oocyte within 30 minutes of intercourse and try to penetrate the corona radiata and zona pellucida (ZP) by hyaluronidase enzyme activity.
- Only one sperm penetrates the zona pellucida. Sperm head is the only structure that goes inside the ovum.
- ZP receptors are stimulated by sperm to allow for sperm entry. Once fertilization occurs, these receptors are reblocked to prevent further sperm penetration.
- Sperm penetration into the ovum initiates the second meiotic division of the oocyte with the extrusion of the second polar body and reduction of its chromosomes from 46 to 23.
- The haploid sperm head and the haploid nucleus of the oocyte combine to restore the diploid state of 46 chromosomes.

Zygote transport and division

- The zygote then travels along the tube propelled by:
 - Muscular peristalsis of the tube
 - Current of the tube whipped by the cilia
- During this period, the zygote gets nutrition and oxygenation from the fluid secreted by the glandular cells of the fallopian tube lining
- The zygote (one cell) divides repeatedly to form a mass of cells (the morula – 16 cell stage). The morula develops into a blastocyst where a cavity is formed and the cells are arranged into an inner cell mass and an outer trophoblast.

- The zygote reaches the uterus 4 days later and remains in the uterine cavity for 2-3 days where it reaches the blastocyst stage (fertilization-implantation interval is 1 week).

Decidua formation

Definition: Decidua is the thickened vascular endometrium of the pregnant uterus.

Structure:

- The decidua like secretory endometrium, consists of three layers:
 - The superficial compact layer containing the glands openings
 - The intermediate spongy layer containing the dilated portions of the gland
 - The thin basal layer containing the base of the endometrial glands
- The separation of placenta occurs through the spongy layer while the endometrium regenerates again from the basal layer.



- After implantation the decidua becomes differentiated into:
 - Decidua basalis: lies deep to ovum between it & the myometrium , it shares in the formation of the placenta
 - Decidua capsularis: lies superficial to the ovum, separating it from the uterine cavity
 - Decidua parietalis or Vera (lateralis): the part of decidua lining the rest of the uterine cavity.
- As the ovum enlarges and fills the uterine cavity, the decidua capsularis fuses with the decidua parietalis thus obliterating the decidual space. This occurs at the 12th week of pregnancy.

Functions:

- Provides the site of implantation of the embryo
- Provides support and protection of the embryo
- Protects uterine wall against invasion by the chorionic villi (Nitabuch layer)
- Provides nutrition of the embryo
- Shares in placenta formation (decidua basalis)
- Secretory function: secretion of certain hormones, enzymes and polyamines,

Implantation

Definition: Embedding of the zygote in the decidua

Site: Decidua of the upper uterine segment (60% posteriorly and 40% anteriorly).

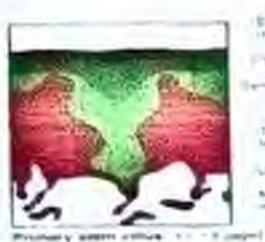
Timing: One week after fertilization

Mechanism:

- Around day 5-6, blastocyst hatches out from ZP and the trophoblast secretes an enzyme that erodes the endometrial lining to create an implantation site.
- Implantation includes 3 stages
 - Stage of apposition
 - Stage of adhesion
 - Stage of penetration

Development of chorionic villi (Post implantation)

- At the blastocyst stage, the embryo is surrounded by the trophoblast (chorion).
- The trophoblast is differentiated into inner cytotrophoblast (Langhan's cells) and outer syncytiotrophoblast
- The trophoblastic tissue (chorionic tissue) penetrates the decidua and erodes the decidual blood vessels leading to formation of free spaces called chorio-decidual spaces. Further development of the chorionic tissue in these spaces forms chorionic villi
- Types
 - Primary villi: inner cytotrophoblast and outer syncytiotrophoblast
 - Secondary villi: as primary villi + central core of mesoderm
 - Tertiary villi: as secondary villi + fetal blood vessels in the mesoderm
- They are subdivided into
 - Chorion frondosum: opposite decidua basalis
 - Chorion laeve: opposite decidua capsularis
- Functions
 - Nutrition
 - Support
 - Secretion of placental hormones.
- Nitabuch layer: A zone of fibrinoid degeneration between decidua basalis and trophoblastic layer.



The placenta, umbilical cord and fetal circulation

LEARNING OBJECTIVES:

- To list different placental functions including barrier, nutritive, respiratory, excretory and endocrine functions
- To describe various placental abnormalities and its implications on placental functions
- To describe the anatomy of the umbilical cord and its various anomalies
- To describe the hemodynamics of fetal circulation and its postnatal changes.

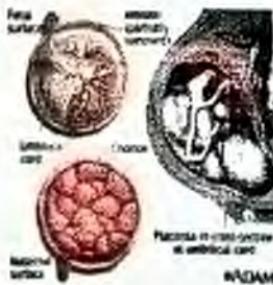
The placenta

Embryology:

- Maternal part: From decidua basalis
- Fetal part: From chorionic villi

Anatomy:

- Shape: Discoid
- Color: Dark red
- Diameter: 15-20 cm.
- Weight: 500 gm.
- Thickness: 2 inches at the center, thinner in the periphery
- Surfaces: Fetal surface and maternal surface



Fetal surface:

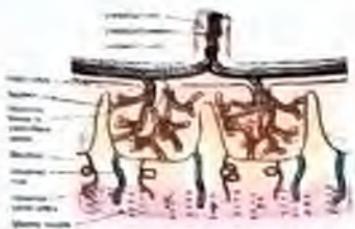
- Covered by a smooth glistening amnion
- Umbilical cord is attached to it (usually at or near the center).
- Branches of the umbilical blood vessels are visible beneath amnion as they radiate from the insertion of the cord.
- Amnion can be peeled off from underlying chorion except at insertion of cord.

Maternal surface:

- Rough, non-glistening and covered by decidua basalis.
- It is divided into (15–20) cotyledons by septa arising from the maternal tissues.
- Each cotyledon may be supplied by its own spiral artery.
- Numerous small greyish spots may be visible on the maternal surface representing calcium deposition in degenerated areas

Histology: (Placental Blood Barrier)

- Layers:
 - Syncytiotrophoblast
 - Cytotrophoblast
 - Mesoderm of the villi
 - Endothelial lining of the fetal blood vessels



- After 20 weeks, the cytотrophoblast and mesoderm disappears and the barrier is formed only of 2 layers.
- After 24 weeks, progressive thinning of the barrier occurs.

Functions of the placenta:

- Respiratory function: (Main function) exchange of gases between maternal and fetal blood
- Hematological function: producing fetal hemoglobin
- Nutritive function: For transfer of glucose, amino acids, vitamins ... etc.
- Excretory function: Acting as a fetal kidney
- Secretory function: Enzymes e.g. insulinase, proteins and hormones (endocrine function)
- Barrier against infection

Endocrinological functions of the placenta:

- Syncytiotrophoblast:
 - Human chorionic gonadotropin (β -hCG)
 - human placental lactogen (HPL).
 - Estrogen and progesterone
- Decidua and fetal membranes:
 - Relaxin
 - Prolactin
- Human chorionic gonadotropin:
 - Structure: Glycoprotein most similar to LH
 - Levels:

- Secretion starts 1 day after implantation
 - level is 100 IU/L on the day of the missed period
 - It doubles every 2-3 days
 - It reaches a peak of 100,000 IU/L at 10-12 week, and plateaus during the rest of pregnancy.
- o Functions:
 - Maintains corpus luteum and stimulates secretion of progesterone.
 - Adrenocorticotrophic effect on fetus
 - Development of male fetus genitalia
 - o Clinical uses:
 - Diagnosis of early pregnancy and ectopic pregnancy
 - Diagnosis and follow up of ectopic pregnancy
 - Diagnosis and follow up (as a tumor marker) of gestational trophoblastic disease
 - Ovulation induction and luteal phase support
- Estrogen:
Mainly (90%) Estriol
 - o Functions:
 - Increases size and vascularity of genital tract.
 - Increases sensitivity and expression of myometrial oxytocin receptors.
 - Increase the growth of the nipple and duct system of breast.
 - Increases water retention and protein synthesis.
 - Progesterone:
 - o Functions:
 - Prepares the decidua
 - Promotes smooth muscle relaxation of the uterus, ureter and gut
 - Raises body temperature
 - Increases development of alveolar system of breast
 - Human placental lactogen (HPL):
 - o Has a structure and function similar to growth hormone.
 - o Functions:
 - Modifies maternal metabolism to increase the energy supply to the fetus
 - Lactogenic, somatotrophic and erythropoietic effects

- Relaxin:
 - Functions:
 - Uterine relaxation

Abnormalities and diseases of the placenta

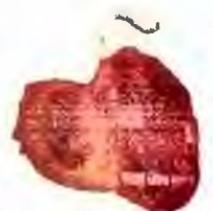
- Abnormalities in the site of implantation:
 - In lower uterine segment (placenta previa)
 - In tube, cervix, peritoneum and ovary (ectopic pregnancy)
- Abnormalities in the size of the placenta
 - Increased size: DM, Multiple pregnancy and Rh isoimmunization
 - Decreased size: Severe pre-eclampsia, heart disease, IUGR
- Abnormalities in the shape of the placenta
 - Bilobate or multilobate placenta: 2 or more equal lobes attached by placental tissue.
 - Bipartite or multipartite placenta: 2 or more equal lobes attached by a membrane
 - Placenta succenturiata: 2 unequal lobes attached by placental tissue or membrane.
 - Circumvallate placenta: Thick whitish ring around the edge of placental fetal surface.
 - Annular Placenta: empty center
 - Fenestrated placenta: empty eccentrically
 - Placenta membranacea: Thin and large placenta
- Abnormal attachment of the cord:
 - Marginal insertion: Battledore placenta.
 - Velamentous (membranous): Cord is inserted into membranes.
 - Vasa previa: placenta previa + velamentous insertion of cord
- Adhesions:
 - Placenta accreta: Villi penetrate decidua just into the myometrium.
 - Placenta increta: Villi penetrate deeply in the myometrium.
 - Placenta percreta: Villi penetrate to subperitoneal myometrium and may invade other structures e.g., urinary bladder.
- Traumatic:
 - Retro-placental hematoma
- Inflammatory:
 - Infection e.g. Syphilis, TB.



Bilobate placenta



Bipartite placenta



Placenta succenturiata

- **Neoplastic:**

- Placental neoplasms: GTD
- secondary neoplasm (e.g. melanoma)
- Placental cysts

Umbilical cord

Embryology:

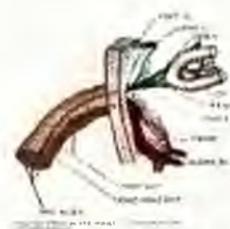
From the ventral connecting stalk (mesoderm connecting inner cell mass with chorion)

Anatomy:

- Length: 50 cm (30-70 cm.) at term
- Diameter: 2cm
- Shape: Thick, soft and tortuous

Histology:

- Covering amnion
- Wharton's jelly; myxomatous tissue around blood vessels
- Blood vessels:
 - Umbilical vein (carrying oxygenated blood to the fetus)
 - 2 umbilical arteries (carrying non-oxygenated blood from the fetus)



Anomalies and diseases of the umbilical cord

- Abnormal in length:
 - Short cord, < 30 cm
May cause avulsion of the cord or prolongation of the second stage of labor.
 - Long cord, > 70 cm
May cause cord prolapse or true knots.
- Abnormal attachment into placenta:
 - Marginal insertion: Battledore placenta.
 - Velamentous (membranous): Cord is inserted into membranes.
 - Vasa previa: Fetal vessels traverse the membranes near the internal os in advance of the fetal presenting part.
- Abnormal number of blood vessels:
 - 1 umbilical artery (may be normal variant in 1%)



- **Knots:**
 - True: When fetus passes through a loop of a long cord. It may lead to IUGR or IUFD.
 - False: Localized collection of Wharton's Jelly or aneurysmal dilatation of blood vessels.
- Exomphalos (Congenital umbilical hernia)
- Hematoma: due to rupture of one of the umbilical vessels
- Inflammatory: Funitis
- Neoplastic: cysts, myxoma, hemangioma and melanoma



True knot

Placenta and fetal Circulation

The placental circulation consists of two distinctly different systems;

Uteroplacental circulation:

- Uteroplacental circulation is the maternal blood circulating through the intervillous space.
- Intervillous blood flow at term is estimated to be 500–600mL/min, and blood in the intervillous space is replaced 3–4 times per minute.
- Pressure and concentration gradients between fetal capillaries and intervillous space favors placental transfer of oxygen and other nutrients to the fetus.

Feta-placental circulation:

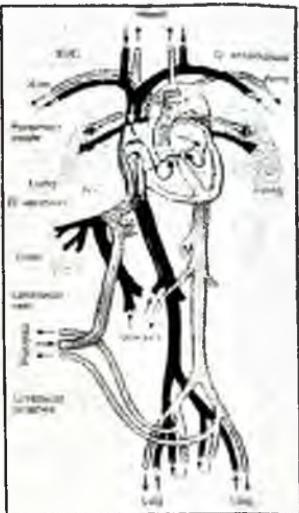
- Two umbilical arteries carry deoxygenated blood from the fetus and enter the chorionic plate underneath the amnion.
- Arteries divide into small branches and enter the stem of the chorionic villi, where further division to arterioles and capillaries occurs.
- The blood then flows to the corresponding venous channel and subsequently to the umbilical vein.
- Maternal and fetal bloodstreams flow side by side, in opposite directions, facilitating exchange between mother and fetus.
- The fetal blood is adapted to carry more oxygen by the following:
 - Fetal hemoglobin (HbF) concentration is 50% higher than maternal hemoglobin.
 - Fetal hemoglobin has higher affinity for oxygen and carries more oxygen (20–30%) than maternal hemoglobin.

Fetal circulation

The circulation is as follow:

- A single large umbilical vein carries oxygen and nutrients from the placenta to the fetus
- In the fetal body most of oxygenated blood in the umbilical vein passes to the inferior vena cava (IVC) through the ductus venosus. The remainder communicates the portal vein to supply the liver which drains through the hepatic veins into the IVC.

- The IVC carries mixed blood (oxygenated blood from the umbilical vein and the desaturated blood from the lower limbs and abdominal organs) to the right atrium.
- Most of the blood is directed to the left atrium through the foramen ovale and from it to the left ventricle and descending aorta.
- The remainder of the blood in the right atrium passes with that coming from the head and upper limbs via the superior vena cava to the right atrium and right ventricle and then through the pulmonary artery to the lungs.
- Most of blood in the pulmonary artery passes to the aorta through the ductus arteriosus because of the high resistance of the unexpanded fetal lungs.
- The blood returns finally from the aorta to the hypogastric arteries to the umbilical arteries to the placenta.



Changes in fetal circulation after birth:

- Ductus venosus → ligamentum venosum

The pressure in the ductus venosus drops with clamping of the umbilical cord, leading to its closure to form the ligamentum venosum.

- Foramen ovale → fossa ovale

The initiation of respiration creates a negative intra-thoracic pressure which is transmitted to the right ventricle and atrium, while the pressure in the left atrium is increased due to returning blood from the lungs this leads to closure of the foramen ovale leaving a remnant called fossa ovale.

- Ductus arteriosus → ligamentum arteriosum

Because of diversion of most of the blood into the lungs, no further blood passes through the ductus arteriosus leaving a remnant called ligamentum arteriosum.

- Umbilical vein → ligamentum teres

The umbilical vein is obliterated to form the ligamentum teres in the falciform ligament of the liver.

- Hypogastric arteries → hypogastric ligaments

The hypogastric arteries are obliterated to form the hypogastric ligaments.

Amniotic Fluid

LEARNING OBJECTIVES:

- To list different sources and characters of amniotic fluid.
- To describe functions and abnormalities of amniotic fluid.
- To define polyhydramnios and describe its clinical picture and management
- To define oligohydramnios and describe its clinical picture and management.

Sources:

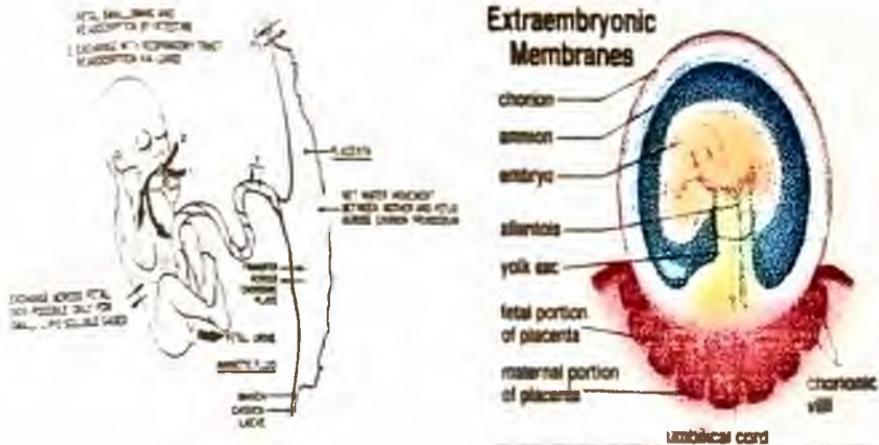
- Before 20 weeks: by diffusion from maternal plasma through amniotic membrane
- After 20 weeks: in addition to diffusion, fetal urination forms the major source (500ml/day) plus other fetal secretions e.g. lung, saliva.

Characters:

- Volume increases throughout pregnancy from 50 ml at 12 weeks, to 500-1500 ml at 38 weeks.
- Color early, clear pale yellow and later opaque
- Osmolality (260 mOsm/L) less than maternal plasma to allow for transudation from maternal plasma
- Reaction: neutral or slightly alkaline (pH 7.15-7.2).

Functions:

- During pregnancy:
 - Protects against trauma
 - Prevents adhesion between fetal skin and amniotic membrane
 - Prevents infection
 - Medium for fetal excretions
 - Allows free fetal movement and normal muscular development
 - Keeps stable temperature around the fetus.
- During labor:
 - Prevents cord compression during uterine contractions.
 - Prevents ascending infection.
 - Helps cervical dilatation
 - Washes birth canal after rupture of membranes



Disorders of amniotic fluid

Polyhydramnios

Definition:

An excess of amniotic fluid detected clinically or by ultrasound examination. The normal range at term is 500-1500 ml.

Incidence: 1% of all pregnancies. (Acute polyhydramnios 1:12000, Chronic 1:200).

Etiology:

- Increased fetal production of urine
 - Decreased fetal ability to swallow or absorb amniotic fluid
- (A) Fetal causes:**
- Congenital anomalies:
 - Anencephaly, spina bifida and meningomyelocele (most common due to):
 - Transudation of CSF from exposed meninges.
 - No swallowing of liquor.
 - Fetal polyuria (lack of ADH)
 - Tracheo-esophageal fistula and esophageal or duodenal atresia (fetus unable to swallow liquor)
 - Twin to twin transfusion syndrome (TTTS): the recipient twin is affected
 - Placental causes:
 - Increased placental mass: twins, diabetes
 - Chorioangioma

a) Placental edema, due to:

- Hydrops fetalis e.g. Rh-incompatibility
- Severe anaemia, A-thalassemia major
- Cytomegalovirus infection
- True knot of the cord causes obstruction of venous return with placental congestion
- Fetal liver cirrhosis as in syphilis

(B) Maternal causes:

- Diabetes mellitus due to:
 - Increased AF osmotic pressure due to its high sugar content,
 - Fetal polyuria resulting from hyperglycemia
 - Associated congenital fetal malformations
 - Increased placental mass
- Pregnancy induced hypertension due to:
 - Edema of the placenta (mirror image syndrome)
- Severe generalized edema, e.g.
 - Cardiac, hepatic or renal

(C) Idiopathic: in about 60% no cause can be identified.

Clinical Varieties

Acute polyhydramnios:

- Very rare
- Rapid accumulation of liquor
- Often occurs before 22-32 weeks
- Acute rapidly progressive symptoms
- The commonest cause is monoamniotic twins but fetal anomalies are also common.

Chronic polyhydramnios:

- More common,
- Accumulation of liquor is gradual
- It occurs in late pregnancy
- Fewer symptoms (uncomfortable rather than painful)
- The condition may end by preterm labor.

Clinical Picture

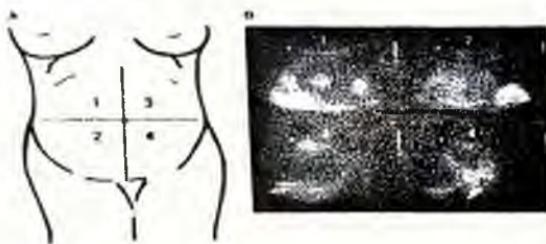
Symptoms:

- Rapid progressive enlargement of the abdomen
- Tense edematous abdominal wall
- Unable to lie comfortably in any position
- Pressure symptoms; dyspnea, palpitation, indigestion, hemorrhoids and lower limb edema.
- Decreased sensation of fetal movements

Examination:

- General examination
 - Orthopnea with respiratory embarrassment
 - Edema of both lower limbs
- Abdominal examination:
 - Inspection:
 - Over distended abdomen,
 - Stretched and glistening skin with dilated veins
 - Palpation:
 - Fundal level > period of amenorrhea
 - Uterus is tense cystic
 - Difficult to palpate the fetal parts
 - Fluid thrill
 - Malpresentation and non-engagement are common
 - Auscultation: difficult to auscultate FHS.
- Vaginal examination:
 - Boggy fornix
 - The cervix may be partially dilated

Ultrasound diagnosis:



Deepest pool of amniotic fluid is > 8 cm or amniotic fluid index (AFI) > 25 cm).

- Amniotic fluid index (AFI): Sum of AF depth in the 4 quadrants of uterus:

7 - 20	Normal
20 - 25	Increased
> 25	Polyhydramnios
5 - 7	Decreased
< 5	Oligohydramnios

- Deepest vertical diameter of an amniotic fluid pocket:

8-9.9 cm	Mild polyhydramnios
10-11.9 cm	Moderate polyhydramnios
>12 cm)	Severe polyhydramnios

Differential diagnosis:

- From other causes of oversized uterus e.g. twins
- Ovarian cyst with pregnancy
- Maternal ascites
- FULL bladder

Complications

- Maternal
 - During pregnancy:
 - Abortion
 - Preterm labor
 - Pregnancy induced hypertension.
 - Pressure symptoms
 - Malpresentation.
 - During labor
 - Premature rupture of membranes
 - Cord prolapse
 - Placental abruption
 - Shock
 - Postpartum hemorrhage
- Fetal
 - Prematurity
 - Asphyxia due to cord prolapse or placental separation.

Treatment

1) Expectant treatment:

- Bed rest
- Ultrasound to rule out twins or fetal abnormality
- Glucose tolerance test for DM
- Analgesics and sedation if very painful
- Treatment of underlying maternal condition as diabetes mellitus
- Noo-steroidal anti-inflammatory drugs:
 - May be used to decrease production of amniotic fluid
 - May cause fetal oliguria and constrict fetal ductus arteriosus.

2) Amniocentesis

- Technique:

- Through abdominal wall with narrow bore needle guided by ultrasound
- 1.5-2 liters can be aspirated in a rate not exceeding 500 ml/hour).
- Gradual escape of liquor avoids shock and separation of the placenta due to sudden decrease in intrauterine pressure.

- Indications:

- May be indicated in premature fetus with marked pressure symptoms
- Can be repeated if amniotic fluid rapidly accumulates

- Complications:

- Preterm labor
- Injury to the fetus or umbilical cord
- Infection

3) Termination of pregnancy:

- Indications:

- When the fetus becomes mature
- Abnormal fetus
- If the symptoms are not improved or get worse

- Techniques:

- Artificial rupture of membranes by Drew Smythe catheter to rupture the hind water
- Allow for slow drainage of amniotic fluid
- Watch for cord prolapse
- Cesarean section for malpresentation
- Watch for uterine dysfunction and postpartum hemorrhage after labor.

* Acute polyhydramnios often requires repeated amniocentesis for severe symptoms or termination of pregnancy for associated fetal anomalies.

Oligohydramnios

Definition: Reduction of amniotic fluid amount < 500ml.

Incidence: 1:750

Causes:

- Chronic placental insufficiency:
 - Severe PET
 - IUGR
 - Post-term pregnancy
- Urinary tract malformations: as bilateral renal agenesis (Potter's syndrome).
- PROM



Complications:

- Related to the cause:
 - IUGR is associated with fetal and neonatal mortality and long term morbidity
 - PROM can cause preterm labor and intrauterine infection
- Related to decreased AF volume:
 - Pulmonary hypoplasia: AF is essential for lung distension and maturation.
 - Abnormal attitude and presentations (e.g. breech)
 - Cord compression and fetal asphyxia
 - Limb abnormalities: talipes, amniotic band syndrome and congenital amputation.



Amniotic band syndrome

Diagnosis

Abdominal examination:

- Uterus is small for date
- Fundal level < period of amenorrhea
- Uterus feels full of fetus

Ultrasound diagnosis:

- Amniotic fluid index (AFI): <5
- Deepest pool amniotic fluid: <2 cm
- Exclude congenital anomalies and IUGR.

Management

According to the causes and associated conditions

- PROM
 - Give prophylactic antibiotics
 - Monitor for signs of infection
 - Consider induction of labor after 34-36 weeks
- IUGR
 - Follow-up with Doppler and cardiotocography (CTG)
- Post-term:
 - Termination of pregnancy
- During labor:
 - Observe for fetal distress (very common).

Maternal physiological changes during pregnancy

LEARNING OBJECTIVES:

- To describe genital changes during pregnancy with emphasis on the difference between upper and lower uterine segments.
- To describe changes in the different systems during pregnancy.

The genital system

Uterus:

A. Anatomical changes:

- Increase in size and weight:
 - Length increases from 7.5 cm in the pre-pregnant state to 35 cm at term.
 - Uterine cavity expands from 4 to 4000 ml.
 - Weight: from 50-70gm to 1000 gm. at full term.
 - Increase in size and weight are due to muscle hypertrophy up to 20wks, after which stretching of the muscle fibers occurs.
- Level:
 - < 12 weeks pelvic organ and > 12 weeks abdominal organ
 - At 12 weeks: at level of symphysis pubis.
 - At 24th weeks: at level of umbilicus.
 - At 36th weeks: at level of xiphisternum
- Shape:
 - The non-pregnant uterus is pear shaped.
 - At 8th week, it is globular with the size of an orange,
 - At 16th week, it becomes pyriform again and remains as such until term.
- Consistency:
 - The uterus shows progressive softening due to:
 - increased vascularity
 - presence of amniotic fluid
- Position:
 - In 80% of cases, the uterus is dextroflexed (deviated to the right) and dextrorotated (twisted on itself from left to right).
 - Dextrorotation is caused by the presence of sigmoid colon on the left side of the pelvis and brings left round ligament nearer to the midline.
- Increased vascularity:
 - The uterine and ovarian arteries and branches of the superior vesical arteries undergo massive hypertrophy.

- Uterine blood flow increases from 750mL/min at 10 weeks to 500-700 mL/min at term
- Histological changes:
 - Endometrium: Decidua
 - Myometrium: Hypertrophy and hyperplasia and increased elastic fibers
 - Uterine ligaments: Hypertrophy.

B. Physiological changes

- Braxton Hick's contractions
 - Irregular, non-rhythmic and sporadic contractions
 - Their intensity varies between 5 and 25 mm Hg
 - They help placental circulation early in pregnancy.
 - These contractions may be detected by bimanual examination in the first trimester (Palmer sign) and by abdominal examination in the second trimester.
 - Although usually painless, they may cause discomfort in last weeks of pregnancy and called false labor pains
- Lower uterine segment formation

After 12 weeks, the isthmus (0.5cm) starts to expand gradually to form the lower uterine segment which measures 10 cm in length at term.

Clinical importance:

- It is the site of lower segment cesarean section (LSCS)
- If the placenta is implanted it will be placenta previa (PP)
- It may form a pathological retraction ring during obstructed labor

Comparison between upper and lower uterine segment

	Upper segment	Lower segment
Peritoneum	Adherent	loose
Muscle layers	3 layer (inner circular, middle oblique (figure of 8) and outer longitudinal)	2 layers(inner circular , outer longitudinal)
Membranes	firmly attached	loosely attached
During labor	more active contracts and retracts becomes thicker and shorter	less active relaxes, stretches becomes thinner and longer

Cervix:

- Hypertrophy and softening: (Goodell's sign)
- Increased vascularity
- Blue or violet discoloration: (Chadwick's sign)
- Reduction of cervical collagen towards term to enable its dilatation
- Cervical mucus plug: closes the cervix and discharged as bloody show with onset of labor.

Vagina:

- Hypertrophy and softening
- Increased vascularity: Varicose veins of the vulva
- Blue or violet discoloration: Chadwick's sign
- High estrogen levels stimulate glycogen synthesis and deposition:
 - action of lactobacilli on glycogen in vaginal cells produces lactic acid
 - lactic acid lowers the vaginal pH to keep the vagina relatively free from any bacterial pathogens.

Ovaries:

- Increase size and softening.
- Increase vascularity.
- Inhibition of ovulation
- Corpus luteum degenerates at 10th week, but pregnancy luteoma may occur.

The breast



- Increased size and softening.
- Increased vascularity
- Nipples: become more prominent, erectile and sensitive.
- The nipple and areola become darker (on 2nd month).
- Montgomery's tubercles (hypertrophied sebaceous glands) appear from the 2nd month
- Secondary areola: less pigmented area around the areola appears with start of 2nd trimester.
- Colostrum (thick, glossy, protein-rich fluid) can be expressed by the end of 3rd month.
- Prolactin stimulates the cells of the alveoli to secrete milk, but its effect is blocked during pregnancy by the peripheral action of estrogen and progesterone.

The Cardiovascular system

- Blood volume increases 40-50% (maximum by 32 weeks).
- Heart rate increased by 10-15 bpm
- Stroke volume increases due to heart muscle hypertrophy, increased blood volume and decreased peripheral resistance as placenta acts as A-V shunt.

- Cardiac output (COP) increases mainly due to increased stroke volume (cardiac output = HR X SV).
- (COP) rapidly increases in the first trimester by 40% and steadies for the rest pregnancy.
- The heart is enlarged, displaced upward
- A functional systolic murmur is heard over the heart.
- Arterial blood pressure decreases, especially during the second trimester.
- Maximum increase in cardiac output and blood volume occurs during labor

Hematological changes

- Plasma volume red cell volume increase during pregnancy.
- This begins at 8-10 weeks' gestation and reaches peak levels at 32 weeks.
- Increase in plasma volume is larger than the rise in red cell volume.
- The net result is a drop in hemoglobin (Hb) and hematocrit (Hct) levels. This is known as physiological anemia of pregnancy.

The renal system

- Anatomical Changes:
 - Kidney size increases by about 1cm in length.
 - Marked dilatation of the calyces, renal pelvis, and ureter from first trimester
 - Urinary bladder: relaxes and its capacity increases.
- Physiological changes:
 - Renal blood flow (RBF) and glomerular filtration rate (GFR) increase by 40% in the first trimester.
 - Creatinine clearance increases and levels of serum creatinine and urea decreases
 - Glycosuria and aminoaciduria due to decreased renal blood- threshold
 - Urinary tract infection is more common due to ureteric dilatation stasis.
 - Increased frequency of micturition due to:
 - Pelvic congestion, edema of the mucosa of bladder and urethra
 - Pressure on bladder by gravid uterus or head late in pregnancy
 - increased GFR which increases urine output

The respiratory system

- Anatomical changes.
 - Subcostal angle: widens.
 - Diaphragm: rises by 4 Cm.
 - Transvers diameter of thorax: increased 2 Cm.
- Physiological Changes:
 - Residual-volume: decreases by 15 to 20 % due to elevation of diaphragm.
 - Hyperventilation: increases of PO₂ and decreases of PCO₂

- Increased arterial pH slightly to 7.44 (Mild respiratory alkalosis)
- Dyspnea is common in late pregnancy due to:
 - Hyperventilation (progesterone effect)
 - Elevation of the diaphragm (especially during the 8th month)

The gastrointestinal tract

- Morning sickness: nausea and sometimes vomiting occurring during early morning.
- Gastric mobility is low and gastric secretion is reduced, resulting in delayed gastric emptying
- Constipation: due to pressure of uterus on pelvic colon and progesterone relaxing effect
- Reflux esophagitis (heartburn): due to decreased tone of esophageal sphincter and displacement through the diaphragm caused by increased abdominal pressure.
- Ptyalism: due to difficulty in swallowing
- Pica: where the patient desires or refuses certain foods or odors.
- Pyrosis (Heart burn): due to regurgitation of stomach contents.
- Hypochlorhydria: due to regurgitation of alkaline intestinal chyle into stomach.
- Hypotonia of gall bladder: increased susceptibility to gall stones.
- Epulis (gum hypertrophy and edema)
- Hemorrhoids: due to constipation and high venous pressure (by uterine compression).

The immune system

- Decreased cell mediated and humoral immunity (immuno-suppressive state)
- Interferon is absent in pregnancy
- Leukocyte count increased (up to 16000).

The Endocrine system

- Pituitary:
 - Anterior pituitary increases in size and activity.
 - Posterior pituitary produces oxytocin thus stimulating onset of labor.
 - Increased plasma levels of prolactin (Estrogen effect).
- Thyroid:
 - Increased in size and activity
 - Total T₃ and T₄ are increase but the free portion is unchanged.
 - Physiological goiter is unlikely in the absence of an iodine deficiency.
- Parathyroid.
 - Increased size and activity to regulate the increased calcium metabolism
- Adrenals:
 - Increased activity
 - Total cortisol is increased but the free portion is unchanged.

The skin

- Pigmentation in :
 - Linea nigra, nipple, and areola
 - Chloasma (brown patches of pigmentation seen especially on the face)
due to high estrogen and progesterone levels and increased precursors of adrenal hormones
- Stria:
 - Variable incidence
 - Due to disruption of subcuticular collagen fibers by increased adrenocortical hormones, and relatively rapid expansion of the abdominal skin.
 - Rubra (red): stretching of skin and appearance of subcutaneous blood vessels.
 - Albicans (white): due to fibrosis in stria rubra
 - Nigra (black): due to stretching + melanocytic activity.
- Itching and pruritis: due to bilirubin and bile salts
- Palmar erythema and spider naevi are also common
- Pruritic urticarial papules and plaques (occurs over the trunk)

Metabolic changes

- Protein metabolism:
 - Positive nitrogen balance
 - Increased daily requirements for protein intake during pregnancy
- Fat Metabolism:
 - Increased lipolysis leading to increased free fatty acids due to the action of human placental lactogen
- Carbohydrate Metabolism:
 - Pregnancy is diabetogenic mostly during 3rd trimester due to insulin antagonism, by human placental lactogen, estrogen and progesterone of pregnancy and due to production of insulinase by the placenta cortisol.
 - Normal pregnancy is characterized by :
 - Mild fasting hypoglycemia
 - Postprandial hyperglycemia
 - Hyperinsulinemia (B cells hyperplasia)

Diagnosis of pregnancy

LEARNING OBJECTIVES:

- To list symptoms and signs of pregnancy
- To enumerate sure signs of pregnancy
- To know different diagnosis of fetal heart sounds.

1) Symptoms:

■ Missed period:

The most obvious symptom of pregnancy is cessation of periods in a woman having regular menstruation.

■ Nausea and vomiting (morning sickness)

- Common in the 1st trimester
- May occur at any time of the day
- May sometimes persist throughout pregnancy.

■ Frequency of micturition

- Due to increased urine production and pressure effect of the uterus on the bladder
- Not associated with dysuria, which may denote possible infection.

■ Excessive lassitude or fatigue

- Common in early pregnancy
- Tends to disappear after 12wks gestation

■ Breast tenderness or 'heaviness'

Often seen early in pregnancy, particularly in the first month

■ Fetal movements or quickening

- 18-20wks gestation in the nullipara
- 16-18wks in the multipara.

■ Pica

- Abnormal desire to eat something not normally regarded as nutritive (such as dust).
- Occasionally experienced by pregnant women.

■ Abdominal enlargement

As pregnancy advances

2) Clinical examination

- The vagina and cervix have a bluish tinge due to blood congestion (Chadwick's sign).
- The uterus feels soft and enlarged at bimanual examination.
 - After 12weeks the uterus is palpable abdominally and at 24 weeks it is felt at level of umbilicus

- Fetal heart sounds may be heard using a hand-held Doppler at 8 weeks and at 10-12 weeks by the Prenatal's stethoscope.
- Diminished fundal softness - A woman with the same size of FHS due to rising blood at the uterine veins may be occasionally heard.
- Palpation of fetal parts and movements at 10 weeks
- Braxton Hicks contractions
- Breast signs and skin signs of pregnancy

3) Investigations:

Pregnancy Test:

- 1. Serum pregnancy test:
 - Detects serum h-hCG by ELIZA or RIA tests
 - Can confirm pregnancy within 1 week of missed
 - Qualitative pregnancy test shows a positive result with ~~actual h-hCG levels~~ $> 25 \text{ IU/L}$
 - Quantitative pregnancy test shows actual serum h-hCG levels.
- 2. Urine pregnancy tests:
 - Also detects h-hCG excreted in urine
 - Technique
 - Agglutination inhibition test
 - Add a drop of female morning urine - anti h-hCG serum and mix.
 - Add standard h-hCG adsorbed on latex particles.
 - Results:
 - No agglutination $\rightarrow (-ve)$ pregnancy test.
 - Agglutination $\rightarrow (+ve)$ pregnancy test.
 - Home kits:
 - Add 3-4 drops to the kit and wait 3-4 min.
 - Results:
 - If 2 lines appear $(-ve)$ pregnancy test.
 - If only one line appears $(+ve)$ pregnancy test.



US diagnosis of pregnancy:

- Trans-vaginal sonography (TVS) detects:
 - Gestational sac at 4th week
 - Fetal pole at 5th week
 - Fetal pulsation at 6th week.
- Trans-abdominal sonography (TAS): The same like (TVS) but later by 1 week.

Sure signs of pregnancy:

Pregnancy can be confirmed by ultrasound or X-ray however, the following clinical signs can count as sure signs of pregnancy:

- Palpation of fetal parts
- Palpation of fetal movements
- Auscultation of fetal heart sounds
- Auscultation of the umbilical (fetal) cord

Differential Diagnosis:

- Pseudocyesis (False pregnancy)
- Other causes of low anaesthesia
- Other causes of symmetrically enlarged uterus.

Antenatal care

LEARNING OBJECTIVES:

- To define antenatal care and list its objectives correctly
- To plan protocol for antenatal care with determination of the minimal number of visits
- To list correctly the warning symptoms of pregnancy
- To take appropriate history from pregnant women in antenatal visits
- To understand the common complaints and problems during pregnancy
- To diagnose some obstetric and general conditions from the results of routine investigations

Definition:

Antenatal care is a preventive obstetric health care program to improve maternal and fetal outcome by regular monitoring of pregnancy.

Objectives of antenatal care:

Antenatal care help ensure

- Best possible health status for mother and fetus
- Early detection and timely referral of high risk pregnancy
- Education of the mother about:
- Physiology of pregnancy
- Nutrition
- Alarming symptoms and signs
- Infant care and Breast-feeding

Schedule of antenatal care visits

- For low-risk cases, the following schedule of visits should be followed:
- Up to 28 weeks' gestation every 4 weeks
- 28-36 weeks every 2 weeks
- After 36 every week Thereafter

The initial visit

- The first antenatal visit should take place as early as possible during the first trimester.
- The first antenatal visit should include both booking procedures (registration) and a physical examination.

Booking procedures (Registration) and History

- Personal history
- Complaint, in detail and duration

- Menstrual history, first day of the last normal menstrual period (LNMP)
 - Inaccurate date: when the first day of the last menstrual period (LMP) is not known for sure.
 - Unreliable date: a date that is known but cannot be used for assessment of the expected date of delivery (EDD). e.g.
 - Women with irregular cycles before conception.
 - Women who got pregnant during lactational amenorrhea.
 - Women who were using combined oral contraceptive pills in the three months before conception.
- Obstetric history
 - Number, mode and outcome of previous deliveries
 - Mode of termination
 - Number sex of living children.
 - Birth weights, date of last labor and last abortion
- History of the current pregnancy
 - Symptoms of pregnancy
 - Symptoms of pre-eclampsia
 - Warning signs
 - Fetal movements
- Family history
 - Diabetes mellitus (DM) and hypertension
 - Multiple pregnancy and congenital anomalies
- Medical history
 - DM and hypertension
 - Urinary tract infections (UT)
 - Heart disease
- Drugs or allergies
 - Blood transfusion
 - Rh incompatibility
 - X-ray exposure.
- Surgical history

Examination:

- General (Systemic)
 - Vital signs: pulse, blood pressure and temperature
 - Weight, height, abnormal gait and pallor jaundice.
 - Chest and heart examination
 - Breast examination
 - Lower limb edema
 - Skeletal or neurological abnormalities

- **Abdominal (Obstetric)**
 - Tenderness, rigidity or any palpable organs, fundal level (FL)
 - Fundal grip umbilical grip
 - First and second pelvic grips
 - Auscultation: Fetal heart sounds (FHS)
 - From 10 - 12 weeks, use the hand held Doppler.
 - From 20 – 24 weeks, use the Pinard fetal stethoscope
- **Laboratory investigations**
 - Complete blood count (CBC), ABO grouping and Rh type
 - Screening for diabetes, Wasserman reaction
 - Urine analysis and culture if possible
- Pelvic ultrasound if the woman is not sure of gestational age or if her period is not reliable
- **Periodic visits**

At each visit the following procedures and examinations should be performed.

 - Record new complaints
 - Ask about alarming signs
 - Ask about fetal movements, and rate of fetal growth
 - Provide continuous health education
 - Examination
 - Weight, blood pressure and edema of lower limbs
 - FL, fetal lie, fetal presentation and FHS
 - Laboratory investigations:
 - Screening for gestational diabetes at 24 -28 weeks of pregnancy
 - Urine exam by dipstick for protein, glucose and ketone
 - Assessment of fetal well-being in a low-risk pregnancy
 - Fetal size: assessment of the FL or the symphyseal-fundal height.
 - Fetal kick count: at least 10 movements/12 hours (a change in the kick count is more important than the absolute number)
- At 37 weeks
 - Assessment of fetal size, lie, and presentation
 - Assessment of pelvic capacity, if there is suspicion of pelvic inadequacy (stature < 150 cm, pelvic fractures, or previous CS for cephalopelvic disproportion [CPD])

Health education for pregnant women

- **Adequate nutrition**
 - Calories (2500 Kcal/day)
 - Excess calories lead to fat deposition and obesity.

- The caloric requirement is the same as in the non-pregnant state.
 - There is no benefit of caloric restriction during pregnancy.
- Protein (60 gm/day)
 - Animal sources: meat, fish, cheese, milk and eggs
 - Plant sources: peas, beans and lentils
 - Marked protein insufficiency in diet leads to fetal prematurity and intrauterine growth restriction (IUGR) maternal anemia and edema
- Calcium (1.2 gm/day)
 - Sources: milk, cheese, yogurt and calcium carbonate
 - Insufficient calcium in the diet may lead to rickets in infants and osteomalacia in mothers
- Iron
 - (30 – 60 mg of elemental iron/day)
 - Animal sources: liver and red meat
 - Plant source: dark green vegetables
 - Drug sources: ferrous gluconate, ferrous fumarate and ferrous sulfate
 - A dose of 30 – 60 mg elemental iron/day is enough for most women
 - (Obese women, twins; women who take iron irregularly can take 60 – 100 mg/day).
 - Insufficient iron in the diet leads to maternal iron deficiency anemia.
- Fats
 - If 2/3 of proteins are taken from animal sources, the intake of fats will be adequate.
- Folic acid
 - (400 ug/day) is recommended during 1st trimester.
 - Women who had an offspring with neural tube defects or a strong family history of the disorder) 4-5 mg of folic acid/day is recommended three months prior to conception and for the first 12 weeks of pregnancy.
- Clothing
 - Clothing should be loose, light, and hanging from shoulders.
 - Avoid high heels, shoes with thin soles, belts, or corsets.
- Dental care
 - Have teeth examined twice during pregnancy.
 - Brush teeth after meals.
 - Tooth extraction is allowed even for pregnant women with rheumatic heart disease if prophylactic antibiotics are given.
- Breast care
 - Wash daily to reduce cracking.
 - Massage

- o Nipples, if there is dry secretion, treat with a mixture of glycerin and alcohol.
 - o If retracted, treat by pulling out gently and regularly.
- Sexual activity
 - o is allowed in moderation
 - o It is to be avoided in pregnant women with threatened abortion, preterm labor, or antepartum hemorrhage (APH).
- Travel
 - o Travel is allowed when comfortable
 - o Car safety belts have to be adjusted to be comfortable for the woman.
 - o Those traveling more than three hours (either by car or airplane) must take a break every two hours and walk for about five minutes to decrease the risk of deep vein thrombosis.
- Weight gain (11-13 kg) (25 pounds)
 - o Most of the weight gain occurs in the second trimester
 - o Normal weight women should gain 11.5-15 kg
 - o Underweight women should gain 12.5-18 kg
 - o Obese women should gain no more than 7 kg
- Baths
 - o Showers are preferable over tub baths to avoid falling
 - o Vaginal douches are not allowed
- Exercise and work
 - o Exercise should be mild, preferably walking
 - o Housework, if not overbearing, is allowed
- Sleep and rest
 - o Sleep eight hours at night and rest two hours in the afternoon.
 - o Increase amount of sleep and rest toward term
- Smoking (associated with the following)
 - o Fetal anoxia
 - o Low birth weight neonates (LBW)
 - o Prematurity
 - o Pre-labor rupture of the membranes (PROM)
 - o Abruptio placentae
- Drugs

Avoid all unnecessary drugs during pregnancy
- Immunization
 - o Live attenuated vaccines are contraindicated.
 - o Any woman comes in contact with rubella should be tested for rubella antibodies.
 - o Tetanus toxoid to prevent tetanus during each pregnancy should be administrated irrespective of the patient's history of previous administration.

- **Irradiation**

Avoid exposure to irradiation for its teratogenic effect on the fetus.

Common complaints during pregnancy

- **Nausea and vomiting**
 - The most frequent complaints of early pregnancy.
 - In 75% of women, nausea and vomiting start between the first and second missed period and persist until the fourteenth week of pregnancy.
 - In another 15%, the condition may persist until the twenty-second week.
 - To decrease nausea and vomiting advice women to:
 - Eat plenty of carbohydrates such as plain biscuits
 - Smaller, more frequent meals, and refraining from eating to satiation
- **Heart burn and hyperacidity**
 - Avoidance of spicy and fatty foods
 - Avoidance of bending or lying flat for some time after eating
 - If the above fails, antacids can be tried.
- **Ptyalism**
 - Ptyalism may be caused by strange dietary habits, e.g. eating starch.
 - If this is found to be the case, discuss modification of dietary habits with the woman.
- **Constipation**
 - Increase fiber and fluid intake. If no response, give stool softeners.
- **Hemorrhoids**
 - Effective prevention of constipation may reduce hemorrhoids
 - Local agents may be used when indicated.
 - Reassure women that hemorrhoids usually disappear after delivery.
- **Varicose veins and leg edema**
 - The standard treatment is elastic stockings.
- **Edema of the lower limbs**
 - Affects 80% of pregnant women.
 - Leg elevation may help.
- **Leg cramps: Painful spasms of the calf muscles**
 - Occur in 50% of pregnant women particularly in the latter half of pregnancy.
 - Magnesium (citrate or lactate) and Calcium can be supplemented
 - Massaging and stretching the muscle during the attack can help
- **Leucorrhea**
 - An increase in the vaginal discharge is common during pregnancy.
 - In many instances, it is not pathological
 - The presence of an abnormal color, odor, or itching may indicate an infectious etiology

Alarming symptoms and signs

- **Vaginal bleeding**
- **Severe edema**
- **Escape of fluid from the vagina**
- **Abnormal gain or loss of weight**
- **Decrease or cessation of fetal movements**
- **Severe headache**
- **Epigastric pain**
- **Blurred vision**
- **Fever**
- **Abdominal pain (second half of pregnancy)**

(Miscarriage) Abortion

LEARNING OBJECTIVES:

- To define and differentiate between different types of the abortion.
- To define risk factors and complications of abortion
- To describe first aid and actual management of each type of abortion
- To list causes and investigations of recurrent abortion.

Definition:

- Abortion (miscarriage) is the termination of pregnancy before (20-28 weeks according to age of fetal viability) based on the date of LNMP or fetal weight less than 500 gm).
- The term "miscarriage" is preferred for the spontaneous event as "abortion" means intended termination; therapeutic or criminal.

Etiology:

1) Fetal causes:

- Chromosomal abnormalities (50-80% of 1st trimester abortion) e.g. trisomy, monosomy
- Blighted ovum or empty gestational sac (anembryonic pregnancy).

2) Maternal causes:

- General:
 - Endocrine disorders: LPD (luteal phase defect), Hypothyroidism.
 - Chronic medical disorders: uncontrolled DM, Severe hypertension, heart diseases, renal failure
 - Acute febrile illness
 - Infections: septicemia, TORCH, ascending infection from genital tract.
 - Immunologic: Rh incompatibility, systemic lupus erythematosus (SLE) and Anti-phospholipid syndrome (APS).
 - Toxic: drugs, irradiation, alcohol, smoking and excess caffeine
 - Nutritional deficiency: e.g. folic acid, iron.
 - Trauma: e.g. direct trauma, coital trauma, violent sports.
- Local:
 - Uterine myoma particularly submucous ones
 - Congenital uterine malformation
 - Septate uterus
 - Bicornuate uterus
 - Hypoplastic uterus

- o Cervical incompetence
 - Congenital
 - Acquired e.g. after difficult dilatation of the cervix
- o Intrauterine adhesion (Asherman syndrome)
- o Incarcerated retroverted uterus
- 3) Paternal causes:
 - Poor semen with high % of abnormal sperms e.g. double headed sperms
 - Advanced paternal age
- 4) Idiopathic:
 - No evident cause.

Types of abortion

1) Spontaneous abortion (miscarriage)

▪ Threatened miscarriage:

Mild intrauterine bleeding occurring with or without uterine colic, without expulsion of products of conception, and without dilatation of the cervix and the fetus is viable

▪ Inevitable miscarriage:

Intrauterine bleeding occurring with continuous and progressive dilation of the cervix but without expulsion of the products of conception

▪ Incomplete miscarriage:

Expulsion of some but not all products of conception. cervix is usually dilated

▪ Complete miscarriage:

Expulsion of all products of conception

▪ Mated (delayed) miscarriage:

Abortion in which the embryo or the fetus dies but is retained in utero.

▪ Recurrent miscarriage:

Occurrence of three or more consecutive spontaneous abortions

▪ Septic abortion:

Any type of abortion complicated by infection

2) Induced abortion:

Induced termination of pregnancy before 24 weeks gestation (medico-legal viability)

▪ Therapeutic abortion. (Performed for medical indications)

- o Maternal: when continuation of pregnancy exposes the mother to the risk of death or severe morbidity.
 - Severe uncontrolled medical disease as DM, heart diseases, chronic and renal impairment
 - Radiotherapy or chemotherapy as in cancer patients
- o Fetal: Severe congenital anomalies incompatible with life.

- Criminal abortion:

- Induced termination of pregnancy without medical indication
- Abortion performed by a non-licensed medical practitioner or in a non-licensed place even if there is a solid medical indication.

Mechanism of miscarriage:

- Up to 8 weeks:

The gestational sac tends to be expelled complete and the decidua is shed thereafter.

- From 8-12 weeks:

The decidua capsularis ruptures and the embryo is expelled either entire or after rupture of the amnion.

- After 12 weeks:

The placenta is completely formed and abortion is like a miniature labor. It is more common for the placenta to be retained after the fetus is expelled due to its firmer attachment to the uterine wall.

Clinical picture:

- Threatened miscarriage:

- Symptoms and signs of pregnancy coincide with its duration.
- Vaginal bleeding slight or mild, bright red in color
- Pain is absent or slight not radiating to back.
- Cervix is closed.

- Inevitable miscarriage:

- Symptoms and signs of pregnancy coincide with its duration.
- Vaginal bleeding is excessive and may be accompanied with clots.
- Pain is colicky, felt in the suprapubic region and radiating to the back.
- The cervix is dilated and products of conception may be felt through the internal os.

- Incomplete miscarriage:

- Patient usually noticed passage of a part of the conception products.
- Bleeding is continuous.
- On examination, the uterus is less than the period of amenorrhea and the cervix is opened and retained contents may be felt through it.

- Complete miscarriage:

- The bleeding is slight and gradually diminishing.
- The pain ceases.
- The cervix is closed.
- The uterus is slightly larger than normal.
- Ultrasound: shows empty cavity.

- **Missed miscarriage:**
 - Regression of pregnancy symptoms as nausea, vomiting and breast symptoms
 - The abdomen does not increase and may even decrease in size.
 - Fetal movements are not felt or cease if previously present.
 - Milk secretion may start because of the decline in estrogens secretion that was blocking the action of prolactin on the breasts.
 - A dark brown vaginal discharge may occur (prune juice discharge).
 - The uterus fails to grow or even decreases in size and becomes firmer. The cervix is closed
 - The fetal heart sounds cannot be heard

Investigation:

- Pregnancy test.
 - Positive in threatened and inevitable.
 - May turn negative after being positive in other types.
- Ultrasound show either
 - living fetus intrauterine in threatened type.
 - non-living fetus in missed abortion.
 - Remnants of conception in incomplete abortion.
 - Empty uterus in complete abortion
- In septic abortion and missed abortion the following tests are needed:
 - TLC, CRP, blood culture
 - Cervico-vaginal swab for C&S.
 - CBC, KFT, LFT, coagulation profile

Management of miscarriage

Threatened miscarriage:

- Rest, Physical, mental and sexual abstinence.
- Diet: Good nutrient diet.
- Treatment of the cause if obvious
- Drugs: Natural progesterone and
- Anti-D in Rh negative women:
 - All miscarriages > 12 weeks including threatened miscarriage
 - Miscarriage < 12 weeks if uterus is evacuated medically or surgically
- Follow up by US.

Inevitable miscarriage, incomplete miscarriage, missed miscarriage:

- First trimester miscarriage: (<12th week)
 - Vacuum aspiration of products of conception
 - Dilatation and curettage (D and C)
 - Medical evacuation

- Second trimester miscarriage: (> 12 week)
 - Medical evacuation: e.g. Prostaglandins, Pitocin.
 - Surgical: hysterotomy (miniature of C.S): if failed medical treatment or severe uncontrolled bleeding.

Septic miscarriage:

- Control of infection by triple antibiotics, antipyretics and IV fluids
- Evacuation of miscarriage

Complete miscarriage:

Ecbolics – antibiotics

Complications of miscarriage:

- Severe hemorrhage and hemorrhagic shock
- Infection; septic miscarriage.
- DIC: in missed abortion if the dead conceptus is retained for more than 4 weeks and with septic miscarriage.
- Trauma (injury during evacuation): perforation of the uterus or cervical tear.
- Rh iso-immunization: in Rh-ve mothers.
 - Anti-D should be given to all non-sensitized Rh -ve patients in the following circumstances:
 - > 12weeks: all women with bleeding (250IU IM before 20wks and 500IU IM after 20weeks).
 - < 12wks (250IU IM) + uterine evacuation (medical or surgical)
 - Ectopic pregnancies

Recurrent and habitual abortion

Definition:

- Recurrent abortion: Two successive spontaneous abortions
- Habitual abortion: > 3 spontaneous consecutive abortions

Incidence: 0.2 %.

Causes: (persistent causes of abortion)

- Genetic factors : paternal and maternal chromosomal rearrangements
- Embryonic chromosomal abnormalities
- Anatomical factors: septate uterus /cervical incompetence.
- Antiphospholipid syndrome
- Endocrinological abnormalities: DM, thyroid abnormalities
- Chronic debilitating diseases

Diagnosis:

A-History:

- **Obstetric history:**
 - Number, mode of onset, C P and mode of termination of previous abortions
 - History of difficult labor (suspect cervical tear and incompetent cervix uteri)
- **Past history:**
 - Gynecologic disease, operations,
 - Medical disease (e.g.) renal disease and DM
- **Infertility and ovulatory dysfunction** (suspect LPD or progesterone deficiency).

B-Examination:

- General hypertension, thyroid enlargement
- Local: (e.g.) Submucus fibroid, incompetent cervix uteri, intrauterine adhesions.

C-Special investigations:

- Urine analysis, for pus cell (UTI), proteins (nephritis) and glucose (DM)
- T3, T4, TSH, OGTT.
- Serum creatinine, antiphospholipid antibodies
- US: To exclude submucus fibroid, incomplete cervix.
- HSG: To exclude submucus fibroid, incompetent cervix and intrauterine abnormalities as uterine septum or adhesions.
- Hysteroscopy: to exclude intrauterine adhesions and congenital uterine anomalies

Treatment:

- Before pregnancy: Treat detectable causes: e.g.
- Hysteroscopic resection of uterine septum or submucus fibroid
- Treatment of luteal phase defect strict control of DM
- During pregnancy:
- Natural progesterone: if proved progesterone deficiency.
- Strict DM control, cerclage for incompetent cervix

Cervical incompetence

Causes:

- Anatomic incompetence: due to trauma to the cervix:
 - Rapid delivery
 - Instrumental delivery
 - Manual dilatation of the cervix during labor
 - Mechanical dilatation during D & C and induced abortion
- Functional incompetence:
Congenital weakness of the cervix in uterine anomalies

Diagnosis

- History:
 - Repeated mid trimester abortions
 - Painless
 - Preterm labors with living fetus that dies soon.
- Examination:
Vaginal examination: Patulous cervix, short cervix or cervical tears.
- Investigations:
 - In non-pregnant woman:
 - Hegar 8: Passes with no pain or resistance.
 - HSG: Wide internal os.
 - Hysteroscopy: Wide internal os.
 - In pregnant woman:
Trans-vaginal sonography (TVS):
 - Ballooning of membranes into wide internal os
 - Short cervix < 25mm
 - Funneling of cervix

Treatment:

Cervical cerclage

- Timing: 12-14th weeks
- Technique: Non-absorbable sutures

Vaginal:

- McDonald's operation: Surrounds cervix from outside by pure string suture
- Sterodurk's operation: Suture passes around internal os under the cervix (Risk of McDonald's is compromised thigh laceration)

Abdominal:

- surrounds cervix by (perimetral) suture
- Needed in rare case of short or absent cervix
- Patient must deliver by C/S

When to remove the sutures:

A:

1. Complicated 37 weeks
2. Uterine contractions of $\geq 37\text{ m}$
3. Of Rite

Complications:

- Early
 - Infection of cervix or membranes (chorioamnionitis)
 - Premature ROM, premature labor
- Late
 - Cervical dysocia during labor

Cervical Cerclage Procedure



The suture being placed. Cervical canal narrowed around the open cervix after tying the string

Ectopic pregnancy

LEARNING OBJECTIVE

- To define, know the incidence and properly list the causes of ectopic pregnancy
- To list more symptoms, signs and DD of ectopic pregnancy
- To describe available methods for management of ectopic pregnancy.

Definition:

Implantation of the fertilized ovum outside the normal uterine cavity

Common site (95%+): the tubes.

Rare sites (5%): uterus, cornua, ovaries, cervix, abdominal cavity and broad ligamentus

Incidence: 0.5% of pregnancies are ectopic.

The incidence is higher with low socioeconomic standards due to increased incidence of pelvic inflammatory disease.



Cause of ectopic pregnancy:

1) Mechanical factors:

The ovum is fertilized in the fallopian tube and reaches the uterus in 5 days. Any factor that delays the passage of the ovum can cause ectopic pregnancy. These may result from:

- Salpingitis, most common risk factor due to:
 - Destruction of the tubal muscle resulting in narrowing of the tube
 - Destruction of tubal epithelium resulting in reduction or loss of the ciliary current.
 - Peritubal adhesions resulting in restricted tubal motility

Chlamydia is the most common organism associated with tubal damage

- Previous pelvic surgery: Particularly reconstructive tubal surgery.
- Previous ectopic pregnancy: if conservative treatment was carried out.
- Intrauterine contraceptive device: due to its effect on tubal motility or increased incidence of PID.
- Progesterone only pills and injectable contraceptives
- Developmental abnormalities: as abnormally long tube, diverticulae, accessory ostia and tubal hypoplasia (very rare)

2) Premature implantation of the fertilized ovum in the tube due to:

- Early disappearance of the zona pellucida: from the fertilized ovum.
- Trans-peritoneal migration of the fertilized ovum to the contralateral tube
- Presence of ectopic endometrium in the tube.

Pathogenesis:

- The fallopian tube unlike the uterus, is not prepared for implantation as it has weak muscular wall and thin mucosa
- The trophoblast gradually invades and erodes the tubal wall, tubal wall is damaged, pregnancy sac is separated and eventually pregnancy is disturbed. The tubal pregnancy does not usually proceed beyond 8-10 weeks

Fate of tubal pregnancy:

Tubal pregnancy may terminate in a number of ways:

▪ Spontaneous resolution (absorption):

Absorption of very early tubal pregnancy occurs with minimal symptoms and small amount of bleeding.

▪ Tubal abortion:

- Part or all of the products of conception are separated from the tubal wall and expelled to the peritoneal cavity through the tubal ostium.
- It is more common if ovum is implanted in the ampullary portion of the tube.
- If expulsion is complete, the bleeding usually ceases but it may continue due to incomplete separation or bleeding from the implantation site.

▪ Tubal rupture:

- The most dramatic fate of tubal pregnancy but less common than tubal abortion.
- Usually profuse bleeding occurs (intraperitoneal hemorrhage).
- More common if implantation occurs in the isthmus.
- If rupture occurs in the mesenteric border of the tube a broad ligament hematoma will develop.

▪ Tubal mole:

- The gestational sac is surrounded by a blood clot and retained in the tube
- Secondary abdominal pregnancy:
- This is the rarest fate of tubal pregnancy

▪ Abdominal pregnancy:

- The conceptus is expelled complete from the tube and acquires a second attachment in the abdominal cavity.
- It can occasionally go to a full-term abdominal pregnancy where spurious (false) labor may occur.

Clinical picture

Symptoms:

- Short period of amenorrhea:
 - Usually does not exceed 8 weeks.
 - May be absent if the ectopic pregnancy is disturbed before the next menstruation e.g. Ectopic pregnancy in the interstitial portion of the tube.
- Pain:
 - Present in every case and precedes vaginal bleeding.
It may be:
 - Aching due to tubal distension.
 - Colicky in tubal abortion.
 - Stabbing in tubal rupture.
 - Shoulder pain if blood accumulates under the diaphragm.
 - Bladder and rectal irritability in pelvic hematocoele.
- Vaginal bleeding:
 - Due to shedding of the decidua after disturbance of tubal pregnancy.
 - Bleeding is usually slight (less than a normal period) and follows the pain.

Signs:

- General examination:
Manifestation of pregnancy e.g. breast signs of pregnancy.
- Abdominal examination:
Lower abdominal tenderness and rigidity more on one side
- Vaginal examination:
 - Uterus is slightly enlarged and soft.
 - Marked pain in one iliac fossa on moving the cervix from side to side.
 - Ill-defined tender mass may be detected in one adnexa where arterial pulsation may be felt.

Clinical types of ectopic pregnancy

Undisturbed tubal pregnancy:

- No symptoms
- Lower abdominal pain often unilateral.
- Pain is aching in nature and there is no vaginal bleeding.
- Slight tenderness over one side of the uterus
- The tubal mass is rarely felt as a diffuse boggy swelling.

Tubal abortion

Symptoms:

- The most common type, it is called the classical picture of ectopic pregnancy.

- Pregnancy symptoms and signs are present.
- Fainting attacks due to pain and intraperitoneal hemorrhage.
- Nausea and vomiting due to peritoneal irritation.

Signs:

- Anemia of varying degree depending upon the blood loss.
- Hypotension, rapid pulse, temperature slightly higher (up to 38°C) due to absorption of blood from the peritoneal cavity.
- Boggy swelling in the cul-de-sac if pelvic hematocoele is present.

Tubal rupture

Symptoms.

- Short period of amenorrhea (6-8 weeks) or even there is no missed period.

Signs

- Signs of shock rapidly develop as pallor, sweating, air hunger, rapid thready pulse and hypotension.
- Shoulder tip pain due to irritation of the phrenic nerve of the diaphragm by accumulated blood when the patient is lying down.
- The abdomen is distended, rigid with generalized tenderness.
- Shifting dullness may be positive due to intra-peritoneal hemorrhage.
- Local examination: is not preferred as it may induce more disruption.

Pelvic hematocoele

Symptoms:

- Symptoms suggesting disturbed tubal pregnancy since a period of time.
- Pressure symptoms due to accumulation of blood in the Douglas pouch as frequency of micturition, tenesmus and dyspareunia.

Signs:

- A fixed tender swelling is felt in Douglas pouch.
- Uterus is slightly enlarged, soft and pushed forwards and the external os is directed downwards.
- Aspiration of Douglas pouch (culdocentesis) may reveal blood which does not clot on standing.
- Infection may be superadded and a pelvic abscess is formed.



Intact ectopic pregnancy



Ruptured ectopic pregnancy



Pregnancy in a rudimentary horn

Investigations of ectopic pregnancy

- Serum β -hCG:
 - If pregnancy test is negative, normal and abnormal pregnancy including ectopic are excluded.
 - If the test is positive, ultrasonography is indicated.
- Doubling time:
 - In normal pregnancy, the β -hCG level is doubling every 2-3 days during the first 42 days of gestation.
 - Ectopic pregnancy usually shows less than 66% increase in β -hCG level within 48 hours.
 - In 15% of normal pregnancies and abortions there is also slow doubling time.
- Ultrasonography: Most available ultrasound machines can detect intrauterine gestational sac when β -hCG is more than 1200-1500 IU and 6000 IU by transvaginal and trans-abdominal probes respectively. These levels of β -hCG are called discriminatory β -hCG Zones.
 - Ectopic pregnancy is suspected when no intrauterine gestational sac can be seen with:
 - β -hCG levels more than discriminatory β -hCG Zones
 - Fluid in Douglas pouch
 - Thickened decidua
 - Multiechogenic mass in the region of the tubes
- Serum progesterone level
 - Is lower in ectopic than normal pregnancy and usually less than 15ng/ml.
- Curettage:
 - If microscopic examination of the products of curettage reveals decidua and chorionic villi, the condition is abortion of intrauterine pregnancy.
 - If it reveals decidua only or Arias Stella reaction in the endometrium as well (cellular atypia, mitotic activity and glandular proliferation), without chorionic villi ectopic pregnancy is diagnosed.
- Laparoscopy:
Sure diagnostic tool particularly in disturbed ectopic (direct vision).

Treatment of ectopic pregnancy

1) Surgical: (main line of treatment)

- Treatment of ectopic pregnancy is usually removal of pregnancy and sometimes the affected tube by laparoscopy or laparotomy
- Approach
 - Laparoscopy: recommended in most cases.

- o **Laparotomy**: indicated in:
 - Ectopic pregnancies with hemoperitoneum
 - Extensive pelvic adhesions.
 - Morbid obesity.
 - Surgeon: Inexperienced in laparoscopy.
 - Laparoscopy is not available.
 - **Techniques**
 - Salpingectomy: resection of tube (or a part of it) that contains ectopic pregnancy.
 - Linear salpingostomy: open the tube to evacuate its contents and leave it unsutured.
 - Tubal milking: to evacuate the tube (not recommended)
- 2) Medical (Methotrexate)**
- **Route and dose**
 - IM injection: 50 mg/m² single injection
 - Direct local injection: laparoscopic or US guided
 - **Conditions to be fulfilled before medical treatment:**
 - Hemodynamically stable patient, without signs of active bleeding or hemoperitoneum.
 - Size of ectopic gestational sac < 4cm
 - Serum B-hCG < 10,000 IU/L
 - Patient is compliant and available for follow-up.
 - No contraindications e.g. hypersensitivity, immunodeficiency,
- 3) Expectant management**
- No treatment is given and the patient is observed for spontaneous resolution of ectopic pregnancy.
 - **Indications:**
 - No symptoms or signs of rupture
 - Hemodynamically stable patient
 - Size of the ectopic gestation a sac < 4cm
 - Decreasing serum B-hCG.

Uncommon sites of ectopic pregnancy

1) Cornual (interstitial) pregnancy:

- The implantation is in the interstitial portion of the tube.
- It is uncommon but dangerous because when rupture occurs bleeding is severe and usually needs hysterectomy.

Pregnancy in a rudimentary horn:

- Pregnancy occurs in the blind rudimentary horn of a bicornuate uterus.
- Rupture usually does not occur before 16-20 weeks as the horn is capable of some hypertrophy and distension.
- Treatment: Excision of the horn.

2) Cervical pregnancy:

- Implantation is in the substance of the cervix below the level of uterine vessels.
- May cause severe vaginal bleeding.
- Treatment:

- Evacuation and cervical packing with hemostatic agent and gauze.
- If bleeding continues hysterectomy may be needed.

3) Ovarian pregnancy:

- Risk factors:
 - Pelvic adhesions.
 - Ovarian endometriosis.
- Pathogenesis:
 - Fertilization of the ovum inside the ovary or,
 - Implantation of the fertilized ovum in the ovary.

Spiegelberg criteria for diagnosis of ovarian pregnancy:

- The gestational sac is located in the region of the ovary,
- The ectopic pregnancy is attached to the uterus by the ovarian ligament,
- Histological confirmation of ovarian tissues in the wall of the gestational sac.
- The tube on the involved side is intact.

4) Abdominal (Peritoneal) pregnancy:

- Types:
 - Primary: implantation occurs in the peritoneal cavity from the start.
 - Secondary: usually after tubal rupture or abortion.
- Abdominal Examination:
 - Unusual transverse or oblique lie.
 - Fetal parts are felt very superficial with no uterine muscle wall around.
- Vaginal Examination:
 - The uterus is soft, about 8 weeks and separate from the fetus.
 - No presenting part in the pelvis.
- Differential Diagnosis: Rupture uterus.

- Treatment:

- The condition should be terminated surgically through laparotomy
- The fetus is removed and if the placenta is attached to an excisable structure as omentum it is removed with it.
- If the placenta is attached to an important structure it can be left for autolysis which may take months to complete.
- Methotrexate 12.5 mg IM daily for 5 days will destroy trophoblastic tissue and accelerates the involution of the placenta.

Gestational trophoblastic disease

LEARNING OBJECTIVES

- To define causes and genetic background of Gestational trophoblastic disease (GTD).
- To describe the pathological types and symptoms and signs of GTD
- To list the complications of GTD
- To mention available methods of the evacuation and protection of follow up
- To describe the indications of chemotherapy in cases of GTD.

Definition:

Spectrum of disease characterized by hyperplasia of the trophoblast and hydropic swelling of the villi

Incidence:

0.5-2.5/1000 pregnancies, Increases in:

- Certain races, more in Japanese
- At extremes of reproductive age:
 - Increases progressively above 40 years (10 times above 45 years, 1/3 live births over 50)
 - Slightly higher below 18 years
- Low socioeconomic standard
- High parity
- Prior miscarriage
- Smoking
- Diet deficient in folic acid, fat or carotene



Types

1) Complete hydatidiform mole (Vesicular mole)

- The uterus is distended by thin walled, translucent, vesicles of different sizes.
- Histology:
 - Hyperplasia of the trophoblast

- Hydropic swelling of the villi
- Absence of fetal tissues or fetal blood vessels
- No invasion of the myometrium
- Persistence of placental villous structure
- High β-hCG secretion by trophoblast causes multiple theca lutein cysts in the ovaries in about 50% of cases

Other types of GTD

2) Partial hydatidiform mole:

Some fetal tissues and fetal blood vessels are present and the level of β-hCG is not as high as complete mole.

3) Invasive mole

There is an invasion of the myometrium by the molar tissues but the placental villous structure is maintained.

4) Gestational choriocarcinoma

It is characterized by absence of placental villous structure regardless the invasion of myometrium or presence of metastases.

5) Placental site trophoblastic tumor

Genetics of molar pregnancy

- Complete mole: Diploidy (2 paternal sets + 0 maternal set)
- Partial mole: Triploidy (2 paternal sets + 1 maternal set)

Comparison between complete and partial moles

	Complete mole	Partial mole
Definition	All chorionic villi are changed into vesicle filled with fluid.	Some chorionic villi are changed into vesicle filled with fluid.
Age	> 40 years.	Not related.
Etiology	2 sperm fertilizes anucleate ovum. 90%	2 sperms fertilize ovum.
Karyotyping	46 XX or 46 XY. All chromosomes are paternal.	69 XXX or 69 XXV. one maternal and 2 paternal sets
Serum β-hCG	>100,000 IU/L.	Rarely elevated.
Pathology:		
Fetus	Absent.	Present.
Fetal RBCs	Absent.	Present.
Villous edema	Diffuse.	Focal.
Trophoblast proliferation	Diffuse, severe.	Focal, moderate
Clinical:		
Uterine size	Large for date (50%).	Small for date.
Theca lutein cysts	Present (25%).	Rare.
Postmolar disease	20%	4%

Diagnosis:

Symptoms

- Amenorrhea: usually of short period (2-3 months).
- Exaggerated symptoms of pregnancy especially vomiting
- Vaginal bleeding which is:
 - Usually dark brown (Prune-juice fluid)
 - May be associated with passage of vesicles (molar tissues)
 - Variable in amount but rarely severe and life threatening
- Abdominal pain that may be:
 - Dull-aching due to rapid distension of the uterus
 - Colicky due to starting expulsion
 - Sudden and severe due to perforating mole or torsion of ovarian cyst
- Symptoms of associated conditions:
 - Anemia
 - Preeclampsia
 - Hyperemesis gravidarum
 - Hyperthyroidism

Examination:

- General examination:
 - Breast signs of pregnancy
 - Pre-eclampsia develops in 20% of cases, usually before 20 weeks' gestation.
 - Hyperthyroidism develops in 10% of cases manifested by enlarged thyroid gland, tachycardia and elevated plasma thyroxin level.
- Abdominal examination:
 - The uterus is larger than the period of amenorrhea in 50% of cases, corresponds to it in 25% and smaller in 25% with inactive or dead mole.
 - The uterus is doughy in consistency
 - Fetal parts and heart sound cannot be detected except in partial mole.
- Local examination:
 - Passage of vesicles (sure sign).
 - Bilateral ovarian cysts (5-20 cm) in 50% of cases.

Investigations:

- Serum β -hCG level: is highly elevated ($>100,000$ IU/L)
- Urine pregnancy test: is positive in high dilution. 1/200 is highly suggestive, 1/500 is surely diagnostic. In normal pregnancy it is positive in dilutions up to 1/100.
- Ultrasonography reveals:
 - The uterus is filled with multiple small cysts. The term "snow storm" describes the picture used to be seen by old ultrasound machines.
 - No identifiable fetus
 - Bilateral ovarian cysts may be detected.

Complications of vesicular mole:

- Anemia
- Life threatening bleeding
- Uterine perforation
- Torsion of ovarian cysts
- Preeclampsia
- Hyperemesis gravidarum
- Hyperthyroidism
- DIC
- Pelvic sepsis
- Thrombo-embolism
- Development to invasive mole or choriocarcinoma

Treatment of vesicular mole

1) Pre-treatment evaluation

- Chest X-ray for metastasizing mole
- Serum β-hCG for follow-up
- Pre-operative investigations CBC, liver and kidney function tests.

2) Evacuation of the mole (suction evacuation):

As soon as the diagnosis of vesicular mole is established the uterus should be evacuated

▪ Suction evacuation

It is the selected and safest method. It can be done under US guide. Other methods are risky and should be rarely used.

Complications:

- Incomplete removal
- Uterine perforation
- Hemorrhage
- Infection

▪ Surgical evacuation:

- Inferior to suction evacuation
- Indication: small sized uterus in absence of suction apparatus
- Using ring forceps and curettage

▪ Hysterotomy:

Indication: Severe bleeding with closed cervix

***Hysterectomy**

- Perforation of uterus with peritoneal hemorrhage.
- Indication: Age > 40 and patient completed her family

3) Chemotherapy:

Indications:

- o Histological diagnosis of choriocarcinoma or invasive mole
- o Presence of metastasis
- o High level of β -hCG > 4 weeks post evacuation
- o Progressively increasing β -hCG
- o Persistent uterine bleeding post evacuation

Protocols:

- o Methotrexate, Actinomycin D, Etoposide, cyclophosphamide, Vincristine
 - Low risk patients → Single agents
 - High risk patients → Combined agents
- o Prophylactic chemotherapy:

Indications:

- Pre-evacuation β -hCG > 100,000 IU/L
- Large (>6 cm) lutein cysts
- Maternal age > 40 years
- Medical induction, hysterotomy or hysterectomy
- Use of oral contraceptives before β -hCG falls

4) Follow-up:

- It is an essential part of treatment as choriocarcinoma may complicate the vesicular mole after its evacuation.
 - Pregnancy test is repeated every week till it becomes negative then every month for 6 months.
 - Rising β -hCG, level after disappearance means developing of choriocarcinoma or a new pregnancy.
 - Combined contraceptive pills should be used for prevention of pregnancy which can be misleading.
 - Features suggesting residual molar tissue include:
 - o Recurrent or persistent vaginal bleeding,
 - o Amenorrhea,
 - o Failure of uterine involution,
 - o Persistence of ovarian enlargement
- 5) Treatment of subsequent pregnancy:
- o Insure normal pregnancy with US
 - o Examine the placenta during delivery
 - o Measure β -hCG level post pregnancy

Antepartum hemorrhage

LEARNING OBJECTIVES:

- To list different causes of antepartum hemorrhage (APH)
- To describe clinical pictures of APH due to Placenta previa and placental abruption
- To define and list degrees of Placenta previa and describe its symptoms, signs and investigations
- To define and list types of accidental hemorrhage and list its symptoms, signs and investigations
- To describe first aid and outline the treatment modalities for different types of APH.

Definition: It is bleeding from the genital tract after the 24th week of pregnancy and before the end of the second stage of labor

Classification:

- 1) Placental site bleeding:
 - Placenta previa: Placenta totally or partially inserted in the lower uterine segment
 - Abruptio placentae: Premature separation of a normally implanted placenta.
 - Marginal separation: Bleeding from the edge of normally implanted placenta i.e. minor placental abruptions (majority of cases of APH).
- 2) Extra-placental site bleeding:
 - Vasa previa: Bleeding from ruptured fetal vessels
 - Rupture uterus.
 - Bloody show.
 - Cervical ectopy, polyp or tumor.
 - Vaginal varicosity, infection or tumor

Placenta previa

Definition: The placenta is partially or totally inserted to the lower uterine segment

Incidence:

- 0.5% of pregnancies.
- More in multiparas.
- During first half of pregnancy, the incidence of low lying placenta (as diagnosed by ultrasound) is 50%.
- Incidence decreases in late pregnancy due to differential growth of LUS. If rapid growth of uterus compared to placenta (placental migration).

Etiology: unknown, but may be attributed to:

A. Low implantation of the fertilized ovum

- Delayed development of the chorion.
- Deficient decidua (in multipara)
- Dizygotic twins (2 placentae): one in U.S. and the other in L.S.

B. Large - sized placenta e.g.

- Placenta of uniovular twins
- Placenta membranacea

C. Capsular theory:

The chorion leave does not undergo atrophy and grow in the decidua capsularis.

Risk factors

- Maternal: (causes of deficient endometrium)
 - Uterine scarring:
 - Previous CS.
 - Previous myomectomy
 - Previous uterine curettage
 - Age: 9 fold increase in women > 40 years
 - Parity: Multipara
 - Anemia, DM, Cocaine use and smoking
 - Atrophic and inflammatory changes
 - Previous history of placenta previa
- Fetal: (Causes of large placenta)
 - Multiple pregnancy
 - Placenta membranacea
 - Rh isoimmunization

Clinical Types

Major (grade III or IV)

The placenta lies over the cervical os. Cervical effacement and dilatation will result in catastrophic bleeding.

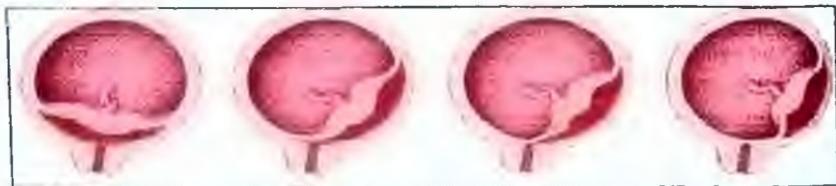
Minor (grade I or II)

The placenta lies in the lower segment, close to or encroaching on the cervical os.

Old classification (based on vaginal examination)

- Type I: (Placenta previa lateralis) placenta in LUS away from internal os.
- Type II: (Placenta previa marginalis) placenta reach margin of internal os.
- Type III: (Placenta previa incomplete centralis) placenta partially covers internal os.

- Type IV: (Placenta previa complete centralis) placenta completely covers internal os.



Type IV

Diagnosis

Symptoms:

- Vaginal bleeding: (main symptom)
 - Characters: Painless, causeless and recurrent, but it may be:
 - painful (e.g. accompanied with uterine contractions)
 - initiated by a cause (e.g. intercourse) or
 - a single attack.
 - Sources: large sinuses in uterine walls (mainly) and separated placenta and its sinuses.
 - Amount: variable from spotting to severe attack
 - Color: fresh with blood clots.
 - Mechanism of bleeding
 - Progressive stretching of the lower uterine segment normally occurs during the 3rd trimester and labor the inelastic placenta cannot stretch with it.
 - This leads to inevitable separation of a part of the placenta with unavoidable bleeding.
 - The closer to term, the greater is the amount of bleeding.

Signs

- General examination
 - The general condition of the patient depends upon the amount of blood loss.
 - Shock develops if there is acute severe blood loss.
 - Anemia develops if there is recurrent slight blood loss.
- Abdominal examination
 - Abdomen is lax, no tenderness or rigidity.
 - Fundal level equals the period of amenorrhea.
 - Fetal parts are easily felt.
 - FHS usually normal (affection if > 50% separation)
 - Malpresentation and non-engagement are common.

- **Ultrasound:**
 - Most cases of placenta previa are diagnosed during routine antenatal US.
 - Undiagnosed cases of APH should have US scan to localize the placenta.
 - US can detect type of placenta previa as well as fetal number, viability and presentation and exclude fetal anomalies.
- **MRI:** Safe but expensive and rarely used for placental localization.
- **Vaginal examination**
 - P/V should be done only when the patient presents with severe APH and ultrasound examination is not available provided that the following precautions are present:
 - The patient is in the theatre, under general anaesthesia,
 - Cross-matched blood is ready to administer,
 - Operating theatre is ready for immediate caesarean section

*Remember; never perform a vaginal examination (VE) in presence of PV bleeding without first excluding a placenta previa "No PV until no PP".

Investigations:

- CBC, liver and kidney function tests, blood sugar level and ECG.
- Fetal wellbeing tests.

Differential diagnosis:

From other causes of APH (e.g. accidental hemorrhage)

Management

1. Asymptomatic placenta previa

- All women with a low-lying placenta diagnosed in early pregnancy should be rescanned at 32 weeks' gestation.
- There is no need to restrict work activities or sexual intercourse in women with a low-lying placenta on ultrasound unless they bleed.
- If the PP is still present at 32 weeks' gestation and is Grade I or II, the woman should be rescanned on 36 weeks' gestation but need not be admitted to hospital unless bleeding occurs.
- Women with asymptomatic major PP (grade III or IV) should be admitted to the hospital and kept for observation. Elective Caesarean section should be performed at 37-38 weeks.
- Some women with asymptomatic major PP (grade III or IV) may remain at home if they:
 - are close to the hospital
 - are fully aware of the risks to themselves and their baby
 - have a constant companion
 - Have telecommunication and transport.

2. Placenta previa with bleeding

- **First aid measures:**

- Admit to hospital.
- Insert a broad-bore I.V. cannula and start an infusion of normal saline. If the woman is shocked start with a colloid infusion, e.g. Hemaccel.
- Take blood for cross-matching and hemoglobin estimation.
- Perform ultrasound as soon as possible because this is more precise.
- Cross-matched blood should be kept permanently available.
- Avoid all digital vaginal examinations.

- **Expectant treatment:**

Includes:

- Check pulse, BP and fetal heart sounds every four hours.
- Check for the amount of vaginal bleeding daily.
- Correct anemia, corticosteroids to enhance fetal lung maturity.
- Fetal movement counts, (NST), biophysical profile twice weekly.
- US for fetal growth and placental location.
- Anti D for Rh-ve women

Indications:

- Mild bleeding and hemodynamically stable patient
- Gestational age < 37 weeks and no fetal distress

- **Active management (Delivery):**

When to deliver:

- Bleeding: Severe bleeding.
- Mother: Labor started.
- Fetus: Fetal maturity or fetal distress

Mode of delivery

- **Vaginal delivery:**
 - Indication: Placenta previa type I and II.
 - Prerequisites: Mild bleeding + vertex presentation + favorable cervix
 - Aim: Descent of the head causes placental compression and stops bleeding
 - Managed by: Artificial rupture of membranes and oxytocin drip
- **Cesarean delivery:**
 - Most cases of PP will need C.S. that should be performed by senior obstetrician and anesthetist.
 - Indications:
 - Type of placenta previa: major PP (grade III or IV)
 - Amount of bleeding: Severe bleeding.
 - Gestational age: >37 weeks (full term).
 - Obstetric indications for CS.

—Complications of placenta previa:

- **Fetal complications:**
 - Prematurity.
 - IUGR: placental insufficiency.
 - IUFD: if separation >50%
 - Vasa previa.
- **Maternal complications:**
 - **During pregnancy:**
 - Hemorrhage anemia, hypovolemic shock, R.F Sheehan Syndrome.
 - Malpresentation and non-engagement of head.
 - **During labor:**
 - Preterm labor.
 - Increased incidence of CS and placenta accreta.
 - Uterine inertia.
 - PROM, cord prolapse.
 - **During puerperium:**
 - Sepsis.
 - Secondary postpartum hemorrhage.
 - Sub-involution of uterus.

Placental abruption (Accidental hemorrhage)

Definition: Premature separation of a normally situated placenta after the 24th week of pregnancy and before delivery of the fetus.

Incidence:

1/100 of pregnancies

- Toxemic type, more in primigravida
- Non toxemic type, More in multiparas.

Causes:

- Hypertension: (50%) due to PET or chronic HTN.
- In non-hypertensive patients: (50%) due to:
 - Trauma to abdomen: as direct trauma.
 - Traction on placenta by short umbilical cord.
 - Toxins: smoking and alcohol and drugs e.g. cocaine.
 - Tension suddenly relieved: e.g. after sudden R.O.M in polyhydramnios.
 - Thrombophilia as protein C and S deficiency, APS.
 - Abruption in a prior pregnancy increases the risk of abruption in subsequent pregnancy by 15- to 20-fold

- Advanced maternal age, Multiparity
- Chorioamnionitis
- Placenta implanted on a uterine septum, submucous fibroid or uterine scar.
- Circumvallate placenta
- Vitamin C, K, E deficiency
- Unexplained No associated cause to explain placental abruption

Pathology:

- Retro-placental hematoma
 - Spasm and degenerative changes in the decidual arterioles leads to bleeding in the decidua basalis that causes separation of the placenta and further bleeding
 - The blood may be retained inside the uterus as a large retro-placental hematoma
- Utero-placental apoplexy (Couvelaire uterus):

Wide spread extravasation of blood into the uterine musculature and beneath the uterine serosa. Internal hemorrhage may occur.
- Disseminated intravascular coagulopathy:
 - It is a rare but extremely serious complication); due to:
 - Thromboplastin like substance and fibrinolysis pass to the maternal circulation at the site of detached placenta
 - Blood loss
 - Liver pathology of pregnancy induced hypertension
 - (Abruption is the most common cause of coagulopathy in pregnancy.
- Anuria: due to
 - Spasm of renal vessels due to shock.
 - Kidney pathology caused by PE (renal vasospasm, caused by hypovolemic, is likely intensified).
- Sheehan's syndrome: due to spasm of cerebral arteries and necrosis of anterior pituitary



Couvelaire uterus

Clinical types

1) Revealed (40%):

- Separation at the end of the placenta.
- Bleeding dissects between membranes and uterus.
- External bleeding.
- Bleeding usually not extensive.



2) Concealed (10%):

- Separation at center of placenta.
- Blood is retained between uterus and detached placenta (retro-placental hematoma)
- Bleeding is extensive but internal not external



3) Mixed: (50%)

- Start as concealed
- With strong uterine contractions separation of the edge of placenta with external hemorrhage (i.e. revealed)
- Bleeding is extensive.

Diagnosis

Symptoms:

- Acute constant severe abdominal pain which may be localized or diffuse (more in concealed or mixed type).
- Dark vaginal bleeding results from escape of blood from the retro-placental hematoma (in revealed or mixed type).
- Cessation of fetal movement is common.

Signs:

- General examination:
 - Shock out of proportion to amount of hemorrhage due to :
 - Concealed and / or mixed hemorrhage.
 - Over distension of the uterus and damage of the myometrium causing neurogenic shock.
 - Blood pressure may be:
 - Subnormal due to hemorrhage,
 - Normal due to falling from previous hypertension or
 - High due to slight bleeding in hypertensive patients.
 - Abdominal examination
- Concealed or mixed type:
- Uterus is large for date and increasing gradually in size due to retained blood.

- Uterus is very tender and hard (board-like).
- Fetal parts are difficult to feel.
- FHS may be absent due to fetal death in severe cases or distressed in mild cases.

Revealed type: as placenta previa

■ Vaginal examination

- Vaginal bleeding which is dark as it is retained for some time before escape.
- If the cervix is dilated the placenta is not felt.

Differential diagnosis

- Revealed: from placenta previa.
- Concealed: from other causes of acute abdomen in pregnancy

Investigations

Placental abruption is a clinical diagnosis

- Ultrasound: has limited sensitivity. It may detect normally sited placenta with retro-placental hematoma that may dissect the placental margin.
- Tests for DIC

Complications

- Fetal complications:
 - Prematurity
 - IUGR; placental insufficiency.
 - IUFD; if separation >50%
 - Congulopathy in the newborn.
- Maternal complications:
 - Shock out of proportion to amount of hemorrhage.
 - Sheehan's syndrome: Pan-hypopituitarism.
 - Renal failure: 75% acute tubular necrosis (reversible) and 25%, acute cortical necrosis (irreversible)
 - Rupture uterus.
 - Amniotic fluid embolism.
 - DIC.
 - Post partum hemorrhage.

Treatment

A. First Aid Management

- Hospitalization and resuscitation.
- Correction of general condition.
- CVP catheter, 2 large wide bore cannulas and urinary catheter.
- IV fluids and fresh blood transfusion.
- Monitoring of vital signs and urine output.

B. Expectant treatment:

Indications:

- Mild bleeding or small hematoma and hemodynamically stable patient
- Gestational age < 37 w and no fetal distress

Includes:

- Check pulse, BP and fetal heart sounds every four hours.
- Check for the amount of vaginal bleeding daily.
- Correct anemia, corticosteroids to enhances the fetal lung maturity.
- Fetal movement counts, (NST), biophysical profile twice weekly.
- US for fetal growth and placental location.
- Anti-D for Rh -ve women.

C. Active management (Delivery):

1) Vaginal delivery: (It is the role)

- Indication: dead fetus + mild to moderate bleeding
- Aim:
 - Decreased maternal blood loss.
 - Avoids coagulopathy during CS.

(In vaginal delivery bleeding stops by uterine contractions, while in CS bleeding stops by coagulation mechanism which is not present here)
- Managed by:
 - Artificial rupture of membranes,
 - Decrease intrauterine pressure.
 - Decrease passage of thromboplastin into circulation.
 - Relives pain and shock.
 - Pitocin drip
 - Stimulate uterine contractions
 - Abdominal binder:
 - Gives no space for uterus to enlarge
 - forces the blood outs

2) Cesarean delivery

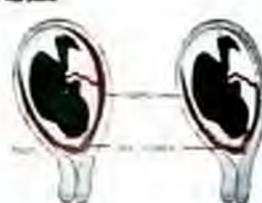
- Indications:
 - Severe bleeding whatever any factor.
 - Living fetus (rarely found) with good chance for postnatal survive.
 - Dead fetus in the following conditions :
 - Failed vaginal delivery for 8 hours (muscles damage)
 - Deterioration of maternal condition despite giving anti-shock measures
 - Obstetric indications for CS.
- Managed by:
 - Senior obstetrician and anesthetist.

- o Correction of general condition and fresh blood transfusion is a must.
- o Special care: Postpartum hemorrhage and Couvelaire uterus.

Vasa previa

Definition: This occurs when the fetal vessels run in membranes below the presenting fetal part, unsupported by placental tissue or umbilical cord with risk of rupture and fetal hemorrhage.

Incidence: 1:2500 to 1:2700



Risk factors:

Occurs when PP associated with

- Velamentous insertion of cord,
- Divided placenta e.g. Bipartite or Succenturiata.
- Low-lying placenta
- Multiple pregnancy
- IVF pregnancy

Clinical picture:

- When the membranes rupture, the fetal vessels are torn
- Slight bleeding with fetal heart rate abnormalities
- Pathological changes in CTG are detected (sinusoidal rhythm on CTG)
- Reported fetal mortality ranges between 33% and 100%.

Investigations: The fetal blood can be detected by:

- Apt's test:
 - o 4-6 drops of the antepartum hemorrhage blood is added to 10 ml of water then 2 ml of sodium hydroxide is added.
 - o The fetal blood remains red/pink for at least 2 minutes and turns green/brown after 10-20 minutes due to resistance to alkali in formation of alkaline hematin.
 - o If the blood is maternal in origin it turns green/brown within 10 seconds.
- Blood film: Fetal RBCs can be detected by a special cytochemical stain and it may be nucleated.

Treatment

- Immediate CS
- If diagnosed antenatally, planned CS should be scheduled at 36 to 38 weeks under controlled circumstances and before the onset of labor, to reduce fetal mortality. Earlier delivery can be considered with documented fetal lung maturity.

Premature rupture of membranes (PROM)

LEARNING OBJECTIVES:

- To define premature rupture of membranes and list its different causes
- To describe clinical picture of premature rupture of membranes and methods of its diagnosis
- To list different complications associated with premature rupture of membranes
- To outline the treatment of premature rupture of membranes at different gestational ages.

Definition: PROM refers to rupture of the membranes before the onset of labor. At less than 37 weeks' gestation this is referred to as preterm premature rupture of the membranes (PPROM).

Problems: Risks of preterm delivery versus risk of intrauterine infection.

Incidence: 2% of all pregnancies.

Risk factors:

- Previous PROM
- Previous preterm labor
- Infections: e.g. amnionitis, cervicitis, vaginal colonization of group B streptococci and bacterial vaginosis
- Uterine over distension (polyhydramnios and multiple pregnancies)
- Uterine anomalies and cervical incompetence
- Structural alterations of the membranes (possibly related to dietary deficiencies of ascorbic acid or copper)
- Malpresentation and malposition
- Trauma: direct or coital trauma.
- Idiopathic.

Diagnosis:

- History
 - History of leaking fluid per vagina usually as a sudden gush of clear fluid followed by persistent leakage
 - History of vaginal infection
 - History of any of the risk factors
 - LMP as management depends on the gestational age
- General examination
 - Maternal tachycardia and pyrexia (temperature > 37.5°C) suggest chorioamnionitis.
- Abdominal examination

- o Presence of tenderness over the uterus suggesting intrauterine infection (red sign)
 - o FL may be less than the period of amenorrhoea
 - o Fetal tachycardia > 160 bpm suggesting the presence of intrauterine infection
- Local examination
 - o Direct digital examination should be avoided as it can introduce or increase the risk of intrauterine infection
 - o Sterile speculum examination leakage from the external os or presence of pool of amniotic fluid in the posterior fornix (The definitive diagnosis).
 - o If no pooling, observe the cervix during Valsalva maneuver or with coughing for flow of fluid from the cervical os.
 - o Exclude cord prolapse
- Investigations
 - o Vaginal swab for culture and sensitivity
 - Nitrazine paper test for pH amniotic fluid is alkaline (7-7.5).
 - Ferning test +ve if amniotic fluid is left to dry on a glass slide (NaCl particles)
 - Nile blue sulphate stain for fetal cells (orange stained cells)
 - Alpha fetoprotein
 - o Laboratory investigations
 - Total and differential leucocyte counts
 - C-reactive protein
 - Urine analysis
- Pelvic ultrasound
 - Assessment of the gestational age.
 - Calculation of amniotic fluid volume,
 - Fetal lie, presentation and placental site.
 - Absence of the fetal breathing movement is one of the earliest signs of intrauterine infection.



Complications

- Maternal risks
 - o Abruptio placae
 - o Retained placenta
 - o Intrauterine infection
 - o Puerperal sepsis and septic shock leading to maternal death
 - o Primary and secondary PPH
- Fetal risks
 - o Prematurity and its complications

- Increased risk of umbilical cord prolapse
- Pulmonary hypoplasia in cases with prolonged PROM <22 weeks.

Management

According to the gestational age:

1) More than 34 weeks gestation:

- Antibiotic prophylaxis (erythromycin)

- Vaginal delivery:

- If the cervix is ripe, allow delivery.
- If the cervix is not ripe, expectant management for 24-48 hours unless there are signs of chorioamnionitis

- C. section for obstetric indications

2) 24 - 34 weeks gestation:

- Active management (delivery):

Indications:

- Patient is in active labor
- Signs of chorioamnionitis
- Fetal distress.
- Maturity

- Expectant management:

Indications:

- Patients not in labor
- No evidence of infection
- No fetal distress

Includes:

- Hospitalization
- Bed rest
- Sterile vaginal pad
- No pelvic examination unless indicated and using sterile gloves
- Continued clinical observation of the mother and fetus
- Maternal observations
 - Pulse, Temperature
 - Change in character of the leaking fluid (color, odor)
 - Uterine tenderness
- Fetal observations: Fetal movement, fetal tachycardia, CTG
- Antibiotic prophylaxis (erythromycin)
- Corticosteroids for fetal lung maturity.

3) Less than 24 weeks gestation:

- Very poor chance of a healthy live birth due to high risk of
 - Pulmonary hypoplasia
 - Muscle-skeletal anomalies
 - Extreme prematurity
- Parents should be counseled for termination of pregnancy

Chorioamnionitis

• Diagnosis by one or more of the following

- Maternal temperature and tachycardia
- Tender uterus
- A foul-smelling vaginal discharge
- Fetal tachycardia (very early sign)
- Rise in maternal white cell count
- Organisms in amniotic fluid

Management:

- Obtain high vaginal swab, mid stream urine (MSU) sample and blood culture
- Induce labor
- Avoid cesarean section because of the risk of maternal infection but it is indicated in the following circumstances
 - Fetal distress.
 - Preterm breech or other abnormal lie
 - A failed induction
- Start I.V. broad-spectrum antibiotics such as erythromycin for both mother and baby

Tocolysis

- Tocolysis is unsuccessful in the presence of infection
- It may mask evidence of maternal infection (e.g. tachycardia).
- Contractions associated with membrane rupture may be indicative of uterine infection
- Tocolysis is used only to prolong the pregnancy a few days to allow for maternal transfer and administration of corticosteroids provided there is no evidence of infection

Diabetes mellitus in pregnancy

LEARNING OBJECTIVES:

- To define and list different types of DM during pregnancy
- To list fetal and maternal complications during pregnancy, labor and puerperium
- To list the indications of glucose tolerance test during pregnancy
- To describe the management during pregnancy-labor and puerperium

Definition

Gestational diabetes: Glucose intolerance (blood sugar abnormalities) of variable severity with onset or first recognition during pregnancy.

Pre-existing diabetes: Patients with blood sugar abnormalities preceding pregnancy

Diabetes not only affects carbohydrate but also protein and fat metabolism due to a relative or absolute insulin deficiency

Risk factors

- Diabetes mellitus, type II in a first-degree relative
- Maternal obesity ($BMI > 30 \text{ kg/m}^2$)
- Previous gestational diabetes
- Poor obstetric history e.g.
 - large neonate ($> 4000 \text{ gm.}$)
 - previous unexplained intrauterine fetal death
- Advanced maternal age ($> 35 \text{ years}$)

Screening for diabetes in pregnancy

- All pregnant women are screened for diabetes at 24-28 weeks' gestation with a 1 hour random oral glucose challenge test. (50 gm. glucose) with no fasting or special preparation, the threshold for a positive test is 140 mg/dL..
- For patients with risk factors, a random oral glucose challenge test (50 gm. glucose) is performed at booking. If negative, the test is repeated again at 24-28 weeks gestation.
- If the screening test is positive ($> 140 \text{ mg/dL}$), a 100 gm. 3 hour oral glucose tolerance test (OGTT) after an overnight fast (8 – 14 hour) should be performed.
- A fasting blood sample is taken and then the patient drinks 100 gm. of glucose in water. Blood samples are taken at one, two, and three hours after the glucose load.
- Normal values:

Fasting	95 mg/dL
1 hour	180 mg/dL
2 hours	155 mg/dL
3 hours	140 mg/dL

- Diagnosis of gestational diabetes is made if any two values are met or exceeded.

Classification of DM

NDDG (National Diabetes Data Grouping):

Type I: IDDM

Type II: NIDDM

Type III: Gestational DM

Type IV: 2ry DM e.g., hormone induced, corticosteroids.

Other classification:

Latent DM: only appears on stress.

Chemical DM: only hyperglycemia with no symptoms.

Clinical DM: hyperglycemia with symptoms

Effect of pregnancy on diabetes:

- Pregnancy is diabetogenic in a predisposed woman (with risk factors).
- Poor control of DM as insulin requirements
 - Decrease in early pregnancy secondary to N/V of pregnancy with hypoglycemia.
 - Increase gradually from the 16th week till term.
 - Decrease intrapartum as uterine activity induce hypoglycemia
 - Decrease postpartum due to cessation of the placental hormones.
- Diabetic retinopathy, neuropathy and nephropathy may be aggravated.

Effect of diabetes on pregnancy:

1) Maternal:

- Abortion in insulin-dependent diabetic mother; if uncontrolled.
- Gestational hypertension and PET.
- Poly-hydramnios.
- Infections- as UTI and vulvovaginitis
- Preterm delivery and its complications.
- Prolonged labor or obstructed labor e.g. shoulder dystocia
- Postpartum hemorrhage.
- Puerperal sepsis.
- Hypoglycemic or hyperglycemic coma

2) Fetal and Neonatal:

- Macrosomia (> 4 kg at term) and the related birth trauma.
- Maternal hyperglycemia leads to fetal hyperinsulinemia.
- Fetal birth injuries due to difficult delivery and shoulder dystocia.
- IUGR: if DM complicated with vascular insufficiency
- Congenital anomalies:
 - Most specific is sacral agenesis, while most common is cardiac anomaly (VSD).
 - May result from either hyperglycemia or ketosis during the organogenesis
 - Fetuses of GDM women are secured.

- IUFD
 - Due to ketosis, hypoglycemia, congenital anomalies or placental insufficiency
 - Commonly after 36 weeks.
- Neonatal death
 - Neonatal hypoglycemia is a very important cause.
 - Other causes e.g. PTL, RDS and congenital anomalies.
- Inheritance of diabetes mellitus (1 %)

Diagnosis

- Obstetric history:
 - Number, mode and outcome of previous deliveries
 - Poor obstetric history
- Symptoms of diabetes:
 - Polydipsia, polyphagia, polyuria and weight loss
 - Recurrent candida vaginitis is more common with diabetes
- Investigations:
 - Complete urine analysis: for sugar and if (+ve) blood sugar.
 - One hour glucose challenge: (the best).
 - Three hours glucose tolerance test: (OGTT).
 - Glycosylated Hb: (HbA1c) (Normally < 8-10%)
 - Maternal: CBC, liver and kidney function tests, blood sugar level and ECG.

Management:

1) Antenatal management:

- Maternal monitoring:
 - Frequency of visits: double the normal
 - Items:
 - Maternal weight gain (Limit weight gain throughout gestation to 9-14 kg (20-30 lb.)
 - Investigations:
 - Urine for glucose, protein and pus cells.
 - Fundus examination.
 - HbA1C:
 - Reflects glycemic control for the past 4-8 weeks.
 - It can determine the risk of congenital anomalies.
 - Maternal: CBC, liver and kidney function tests, blood sugar level and ECG.
- DM control;
 - Diet modification is sufficient for GDM (if FBS< 105 mg/dl).
 - Metformin and Glibenclamide are used safely with results comparable to insulin.

- o Insulin if (FBS > 105 and/ or 2h PBS > 120) after the use of previous measures.
- Hospitalization:
 - o In non-complicated cases: at 36th week
 - o In patients with vasculopathy: at 32th week
 - o If complications occur.
- Fetal monitoring:
 - o NST, Biophysical profile
- 2) Management during labor:
- Timing of labor:
 - o GDM: At 40th week if controlled and uncomplicated
 - o Pre-gestational DM:
 - 37th – 38th week in other classes if controlled and uncomplicated
 - Before 37th week uncontrolled DM or if complicated.
- Method:
 - Indication of CS.
 - o Fetus:
 - Macrosomia,
 - IUGR
 - o Mother:
 - Associated polyhydramnios,
 - PET
 - Bad obstetric history e.g. history of IUFD
 - o Others indications of CS.
- Vaginal delivery: if C.S is not indicated, Induction of labor by AROM + oxytocin can be performed.
- Precautions:
 - o During 1st stage:
 - Decrease daily dose of insulin and replace by insulin and glucose infusion,
 - Strict fetal observation.
 - o During 2nd stage:
 - Only easy smooth vaginal delivery (no instrumental vaginal delivery)
 - Anticipate and proper management of shoulder dystocia.
 - o During 3rd stage:
 - Guard against post-partum hemorrhage.
- 3) Postpartum care:
- The patient is given 1/2 her dose of insulin (loss of anti-insulin effect of pregnancy).
- Lactation: encourages breast feeding.

Neonate; Managed as preterm baby who are liable to: hypoglycemia; hypocalcaemia (tetany), respiratory distress syndrome, polycythemia or hyperbilirubinemia.

4) Contraception:

Long-term: Sterilization (male or female).

Short-term: Mechanical methods (condom or diaphragm), IUS (Levonorgestrel medicated IUD).

Estrogen containing contraceptives are not recommended for women with increased risk of VTE.

Heart diseases in pregnancy

LEARNING OBJECTIVES:

- To list different physiological changes in the cardiovascular system during pregnancy
- To list fetal and maternal complications of heart diseases during pregnancy, labor and puerperium
- To describe the care of cardiac patients during pregnancy, labor and puerperium
- To describe peripartum cardiomyopathy and its management during pregnancy-labor and puerperium.

Incidence:

1-3% of all pregnancies (90% are rheumatic).

Causes:

- Rheumatic: most common MS, MR, aortic valve disease.
- Congenital heart diseases: e.g., ASD, VSD.
- Others: Hypertensive heart disease, syphilitic and thyrotoxic heart disease.

Hemodynamic changes during pregnancy

- Blood volume increases 40-50% (maximum by 32 weeks).
- Heart rate increases by 10-15 bpm. Stroke volume increases
- Cardiac output (HR × SV) increases due to increased blood volume, and decreased peripheral resistance.
- The heart is displaced upward and to the left.
- A functional systolic murmur is heard over the heart.
- Arterial blood pressure decreases, more during the second trimester.
- The increased load on the heart is more liable to occur during:
 - At 28-32 weeks' gestation maximum increase in cardiac output and blood volume occur.
 - Labor: cardiac output increases due to pain and the increased venous return, effect of bearing down, shifting all the blood in the utero-placental circulation to the general circulation after placental separation

New York Heart Association classification (NYHA):

Class I: asymptomatic / uncompromised)

Class II: symptomatic with heavy exertion (slightly compromised)

Class III: symptomatic with light exertion (markedly compromised)

Class IV: symptomatic at rest (severely compromised)

Effect of pregnancy on heart diseases

- Cardiac patients are more liable to experience heart failure.
- Deterioration of the pre-existing cardiac condition (usually passing from one class of cardiac status to another)
- Reactivation of rheumatic condition
- Infective endocarditis may occur after labor or after any manipulative procedure
- Increased liability of thromboembolic complications.

Effect of heart diseases on pregnancy (minimal)

- Preterm delivery due to cervical softening and congestion
- IUGR or IUD (especially in cyanotic heart diseases)
- Hydramnios (especially with heart failure)
- PPH

Diagnosis

- History:
 - Rheumatic fever and its duration, congenital heart disease
 - Previous valve replacement, previous heart surgeries for correction of anomalies
 - Anticoagulant therapy, anti-failure treatment in previous pregnancies
- Primary symptoms of heart disease
 - Dyspnea, orthopnea, paroxysmal nocturnal dyspnea
 - Cough, expectoration, hemoptysis
 - Palpitation, anginal pain, swelling of lower limb
 - Symptoms of endocarditis (fever ± heart failure symptoms)

Management during pregnancy

1) Class I and II

- Maternal monitoring:
 - Frequency of visits: double the normal.
 - Early detection of heart failure or any complication.
- Fetal monitoring: NST, Biophysical profile
- Hospitalization:
 - From 28-32th week: most critical period.
 - At 36th week: to prepare for delivery.
 - If complications occur.

2) Class III

- If patient has completed her family, it is better to counsel for termination.
- If pregnancy is to proceed, hospitalization is advised.

3) Class IV

- Anti-failure measures in preparation for therapeutic termination

Management during labor

- Timing of labor: according to method of termination
- Method.

Vaginal delivery: (the role)

Vaginal delivery is easy due to small fetus and soft cervix from pelvic congestion.

Precautions:

- During 1st stage:
 - Analgesia: morphine
 - Position: semi-sitting (with left lateral tilt).
 - Antibiotics, O₂ mask.
 - Patient should avoid bearing down and, EROM.
 - Continuous maternal and fetal monitoring.
- During 2nd stage
 - No bearing down.
 - Shortening of 2nd stage by vacuum extractor (better) or low forceps
- During 3rd stage
 - Guard against post-partum hemorrhage (by Oxytocin but no ergometrine).
 - Immediate postpartum analgesics and diuretics.
 - Provide prophylactic antibiotics after placental delivery.

Cesarean section

Indications:

- Restricted output e.g tight MS, AS.
- Esinmenger's syndrome.
- Other indications of C.S.
- Aortic dissection.

Management in the postpartum period and during puerperium

- Prophylactic antibiotics against infective endocarditis for 48 hours after delivery of the placenta
- Hospital rest until the patient's condition stabilizes
- Counseling for contraception either using IUD or sterilization
- OCP are contraindicated due to salt and water retention and the possibility of thromboembolism.

Peripartum cardiomyopathy

It is a cardiac condition that develops in the absence of pre-existing heart disease or identifiable cause. It can cause serious complications and maternal mortality.

Timing: Last month of pregnancy up to 5 months after birth.

Etiology:

- The cause is unknown but may be autoimmune or post viral in origin.
- Risks include multiparity, ethnicity, smoking, diabetes, hypertension or pre-eclampsia, and advanced or teen maternal age.

Diagnostic criteria:

- Manifestations of heart failure developing in the last month of pregnancy or within 4 months after delivery,
- Absence of an identifiable cause for the cardiac failure,
- Absence of recognizable heart disease prior to the last month of pregnancy, and
- Left ventricular systolic dysfunction demonstrated by classic echocardiographic criteria, e.g. depressed ejection fraction or fractional shortening along with a dilated left ventricle.

Management:

- Managed "as heart failure" and anticoagulants may be required to prevent thrombi forming in the dilated cardiac chambers.
- Bromocriptine, Pentoxyfylline, and immunosuppressive agents can be used.

Hypertensive disorders with pregnancy

LEARNING OBJECTIVES:

- To define correctly the various hypertensive disorders with pregnancy.
- To describe pathology and effects of PIH
- To list symptoms, signs and complications and outline management of PIH.

Definitions

- Hypertension in pregnancy:
A blood pressure of 140/90 mmHg measured twice 4 hours apart.
- Pathological proteinuria:
 $> 300 \text{ mg/24 hours urine}$. Or $\geq +1$ dipstick (persistent).
- Gestational hypertension:
Hypertension without proteinuria diagnosed in the 2nd half of pregnancy and returns to normal 12 weeks postpartum.
- Chronic hypertension with pregnancy:
Hypertension antedates pregnancy or detected before 20 weeks gestation or lasts > 12 Weeks postpartum.
- Pre-eclampsia:
Hypertension + proteinuria > 20 weeks.
- Eclampsia:
Pre-eclampsia + convulsions
- Superimposed pre-eclampsia:
Development of PEI in patient known to be hypertensive

Classifications

- American College of Obstetricians and Gynecologists classification:
 - Pregnancy induced hypertension (PIH):
 - Hypertension without proteinuria.
 - Pre-eclampsia:
 - Mild
 - Severe
 - Eclampsia
 - Pregnancy aggravated hypertension:
 - Superimposed pre-eclampsia.
 - Superimposed eclampsia.
 - Coincidental hypertension: (pregnancy associated)
 - Hypertension antedates pregnancy or persists postpartum.

- National high blood pressure education program classification:
 - Gestational hypertension.
 - Pre-eclampsia (mild, severe).
 - Eclampsia.
 - Superimposed preeclampsia upon chronic hypertension.
 - Chronic hypertension with pregnancy

Pre-eclampsia (PET)

Definition:

Specific disease of the pregnant human female, occurring in the 2nd half of pregnancy characterized by development of hypertension, proteinuria, with or without edema, If neglected: eclampsia will occur. (*in vesicular mole and twin may occur before 20 weeks*)

Incidence:

5-15 % of all pregnancies (most common medical disorders)

PET is the most common hypertensive disorder with pregnancy.

Risk factors:

- Age: Extremes of child bearing period.
- Parity: More in primigravida, elderly multipara
- Race: More in black races.
- Socioeconomic status: Low socioeconomic status.
- Malnutrition: Fe, protein, Ca, deficiency.
- Obesity (causes DM and HTN).
- Genetic: More with past history or family history of PET.
- Medical disorders: DM, chronic hypertension and chronic nephritis
- Large placenta: Vesicular mole and Twin

Etiology:

It is a disease of theories. The most accepted theory is that, *faulty placentation which is genetically-predisposed and immunologically-mediated*

- Abnormal placentation:
- Failure of second wave of trophoblastic invasion
- Immunological factor:
- Failure of formation of blocking antibodies, resulting in:
- Rejection of conceptus with damage of placenta and subsequent pre-eclampsia.

Pre-eclampsia is less common in previously stimulated immunity conditions as in *previous pregnancy, previous blood transfusion, increased maternal anti-HLA antibodies*.

- Genetic factor:

Daughter's sisters of women with preeclampsia also developed the disease

Women who developed PIH have abnormally high HLA DR4

→ Endothelial dysfunction:

Imbalance of proangiogenic and antiangiogenic factors produced by the placenta may play a major role in mediating endothelial dysfunction.

The disease is more common in:

- Women exposed to trophoblast for the first time.
- Women exposed to abundance of trophoblasts
- Women with known vascular disease.
- Genetic predisposition.

Pathophysiologic changes in pre-eclampsia

▪ Reduced utero-placental perfusion leads to:

- Capillary leak causing edema, proteinuria and hemoconcentration
- Vasoconstriction causing hypertension, oliguria, organ ischemia, abruptio placentae and occurrence of convulsions
- Activation of coagulation causing thrombocytopenia and the release of cytokines and lipid peroxidases causing more reduction in utero-placental perfusion
- Release of vasoactive agents such as prostaglandins, nitric oxide and endothelin

Pathology and pathogenesis

Three major pathologic lesions are primarily associated with pre-eclampsia and eclampsia:

- Hemorrhage and necrosis in many organs secondary to arteriolar constriction.
- Glomerular capillary endotheliosis
- Lack of deciduation of the myometrial segment of the spiral artery

Complications of pre-eclampsia

1) Maternal effect:

- CNS: Eclampsia, cerebrovascular accidents.
- Retina: Papilledema, retinal hemorrhage, retinal detachment.
- CVS: Cardiomegaly, acute heart failure.
- Respiratory: Acute pulmonary edema.
- Liver: Rupture of subcapsular hematoma, jaundice, HELLP syndrome
- Kidney: Acute renal failure.
- Blood: DIC, Hemoconcentration
- Placenta: Abruptio (accidental hemorrhage).
- Puerperium: Sepsis, secondary postpartum hemorrhage and subinvolution of uterus
- Maternal mortality:
 - 2% in severe PET and 10% in eclampsia.
 - Most common cause is cerebral hemorrhage.
- Remote complications:
 - Residual HTN, Residual proteinuria.

- Recurrence:
 - Mild PET in primigravida no recurrence.
 - Severe PET in primigravida - 20-50%.
 - Severe PET in multipara 70%.

2) Fetal effects:

- Prematurity.
- IUGR: due to chronic placental insufficiency.
- IUFD.
- Increased perinatal mortality

Diagnosis of pre-eclampsia

- Prediction:
 - History of risk factors.
 - Rapid weight gain during the 2nd half of pregnancy ($> 3/4 \text{ kg/week}$).
 - "Screening tests": Currently no single test is reliable for clinical use
- Signs:
 - Hypertension:

Diagnosed if Blood pressure $> 140/90 \text{ mmHg}$ measured twice 4 hours apart
 - Proteinuria:

Diagnosed if:

 - Proteins in urine 300 mg/day or $> +1$ dipstick.
 - Detected by: Dipstick test, boiling test or quantitative assay.
 - Edema:
 - (Not a diagnostic criterion).
 - Types:
 - Occult edema: excessive weight gain ($> 3/4 \text{ Kg/week}$ or $> 2 \text{ pounds/week}$)
 - Manifest edema: may affect lower limbs, abdominal wall, vulva
- Symptoms:
 - Headache.
 - Blurring of vision.
 - Nausea and vomiting.
 - Epigastric pain
 - Oliguria or anuria.
- Investigations
 - Urine: 24 hour urine protein.
 - Blood: CBC, hematocrite and coagulation profile
 - Liver functions: bilirubin, enzymes.
 - Kidney functions: serum creatinine, urea, creatinine clearance.
 - Maternal: Fundus examination.
 - Fetal: US and fetal well-being tests.

- Differential diagnosis. From other causes of:
 - Hypertension with pregnancy.
 - Proteinuria with pregnancy.
 - Edema with pregnancy
 - HELLP syndrome.

Indicators of severity of pre-eclampsia

- Presence of symptoms, headache, visual disturbances and/or upper abdominal pain (epigastric or right hypochondrial)
- Diastolic BP \geq 110 mmHg and systolic BP \geq 160 mmHg
- Proteinuria of 3+ or more by urine dipstick or a total protein level of 5 gm/L in a 24-hour urine sampling
- Oliguria
- Elevated serum creatinine,
- HELLP syndrome: Hemolysis, Elevated liver enzymes, Low platelets (thrombocytopenia)
- Fetal growth restriction and/or oligohydramnios

	Mild	Severe
Blood pressure	140-160 / 90-	>160 / 110mmHg.
Proteinuria	< +	— or more
Headache & blurring of vision	Absent	Present
Serum creatinine	N	Elevated
Liver enzymes	N	Elevated
Thrombocytopenia	Absent or Minimal	Marked (100,000/ μ l)
Fetal growth restriction	Absent	Present

Prevention of pre-eclampsia

- Early detection and proper management is the only essential tools for improving maternal and fetal outcomes.
- Low-dose aspirin may help in women at high risk for pre-eclampsia.
- Other treatments as high-protein, low-salt diets, and calcium supplementation do not reduce the incidence of pre-eclampsia. Treatment of pre-eclampsia

Timing of delivery:

- Mild pre-eclampsia
 - Gestation 37 weeks or more: termination of pregnancy
 - Gestation $<$ 37 weeks: expectant management.
 - Expectant management of mild pre-eclampsia
 - Hospital admission for initial assessment.
 - Bed rest with reduction of physical activity

- Frequent BP measurements (every four hours except between midnight and the morning)
- Laboratory investigations: protein in urine, hematocrit, platelet count, creatinine level, uric acid and liver function tests
- Fetal evaluation by ultrasound (on admission and every two weeks thereafter)
- Fetal well-being by modified biophysical profile (NST and amniotic fluid index twice weekly).
- Administration of glucocorticoids to accelerate fetal lung maturation

2) Severe pre-eclampsia

- Management should include the following items simultaneously:
 - 1) Convulsion prophylaxis
 - 2) Antihypertensive therapy
 - 3) Termination of pregnancy

Control of convulsions:

Magnesium sulfate ($MgSO_4$) (drug of choice):

- Indications:
 - Severe PET.
 - Eclampsia.
- Action:
 - Peripheral muscles relaxant (curare like action on the motor end plate).
 - Mild CNS depression.
 - Mild diuresis and vasodilatation.
 - Curare like action and synergistic effect with Ca^{++} channel blockers
- Route: Can be given IV or IM
- Dose:
 - IV regimen: initially 4-6 gm. slowly, then 1-2 gm./hour by IV drip
 - IM regimen: Initially 10 gm. deeply IM then 5 gm./4 hours IM.
- Duration: till 24 hours after labor.
- Therapeutic level: 4-7 mEq/L
- Toxicity and side effects:
 - At level 8-10 mEq/L → Knee reflex is lost and starts myometrial inhibition.
 - At a level 10-15 mEq/L → respiratory depression
 - At a level > 15 mEq/L → cardiac depression
- Monitoring:
 - Serum Mg^{++} level.
 - Urine output > 30ml/h.
 - Respiratory rate > 15min.
 - Preserved knee reflex.

- Antidote: 10 ml. of 10 % Calcium gluconate

2nd line include Diazepam & Phynotoin

Control of hypertension: (anti-hypertensive drugs)

- Indication: Diastolic blood pressure 100mm Hg or more i.e. in severe PET
- Aim: To decrease blood pressure gradually to be around 90 mmHg
- Types:

1) Oral

Alpha methyl dopa (Aldomet).

- o Dose: 1 g load oral, then 1-2 g in 4 divided doses, (its effect appears after 2 days).
- o Mechanism of action: It is a centrally-acting agent, decreasing the sympathetic outflow from the brain stem.
- o Adverse effects. Postural hypotension, depression, nightmares, cholestatic jaundice and hemolytic anemia.

Labetalol (α and β blocker)

Ca channel blocker e.g. Nifedipine

- o Dose: 40 mg/day oral in 2 divided doses (Epilat retard tablet is 20 mg Nifedipine).

Beta blockers e.g. Atenolol.

2) Parenteral

Hydralazine:

- o Dose: administered slowly IV repeated every 15 min till satisfactory response is achieved (diastole 90-100 mmHg).
- o Mechanism of action: It is a direct peripheral vasodilator (arteriolar).
- o Adverse effects: tachycardia (How to avoid).

Nitrates.

Labetalol

Obstetric measures and termination of pregnancy:

Timing of delivery (indications of stopping expectant management):

1) Maternal

- HPN: severe uncontrolled.
- Symptoms: persistent, deteriorate to eclampsia.
- Oliguria $< 500 \text{ ml./24 hours}$
- Pulmonary edema: tight chest, short breath.
- Impaired LFT, (Platelets $< 100,000/\mu\text{l.}$)
- Impaired KFT (s. Creatinine $> 1.2 \text{ mg/dl.}$)
- Suspected placental abruption, PROM, preterm labor

2) Fetal

- Fetal age > 37 (mild PET) & > 34 (severe PET).
- IUGR $<$ 5th percentile for EGA.

- Oligohydramnios AFI < 5.
- BPP < 4.
- Reversed end diastolic umbilical artery flow.
- Fetal death.

Mode of delivery:

- Vaginal delivery: if the fetal presentation and cervix are favorable.
- Cesarean section: indicated in cases of fetal malpresentation, fetal distress or failed induction of labor
- *Intrapartum management:*
 - First stage:
 - Bed rest, oxygen inhalation, fits managing facilities.
 - Observation: Maternal; Pulse, BP, urine output, and proteinuria.
 - Fetal: Continuous fetal heart monitoring.
 - Drugs: Shift to IV antihypertensive (target DBP is 90-100 mmHg).
 - Anticonvulsant drugs.
 - Second stage:
 - Epidural anesthesia is the preferred type (after exclusion of coagulopathy).
 - Shorten 2nd stage by forceps or vacuum extractor
 - Third stage:
 - Prevent PPH using oxytocin (Ergometrine is contraindicated!!!!).
 - Fourth stage:
 - Careful observation to guard against PPH.
 - Postnatal care:
 - Shift to another oral antihypertensive other than Aldomet.

Eclampsia

Definition:

It is the development of convulsions in a pre-existing pre-eclampsia.

Incidence: 1/1000 pregnancies.

Etiology: The exact cause is unknown but cerebral ischemia and edema was suggested.

Clinical picture of an eclamptic fit: (4 stages)

- 1) **Prodroma (Premonitory stage): (1/2 minute)**
 - Rolling up: of eyes and
 - Twitches of the face and hands.
- 2) **Tonic stage: (1/2 minute)**
 - Generalized tonic spasm of all muscles of body.



- o Arching of back (episthotonus)
 - o Spasm of respiratory muscles and diaphragm
 - o Cyanosis.
 - o Clenching of teeth tongue may be bitten.
- 3) Clonic stage:** (1-2 minutes)
- o Repeated contraction and relaxation of all muscles of body 7 convulsions
 - o Face: congested and cyanosed
 - o Eye: conjunctival injection
 - o Mouth: blood stained froth coming out
 - o Respiration: stertorous breathing
 - o High temperature and may be involuntary passage of urine or stool
 - o Gradually convulsions stop, cyanosis passes off
- 4) Coma stage:**
- o Duration: variable
 - o Deep coma may occur with poor prognosis

Eden's criteria for the severity of eclampsia:

- o Blood pressure: systolic > 200 mmHg.
- o Edema: absent.
- o Temperature > 39°C
- o Pulse > 120b/min
- o Respiratory rate: > 40/min.
- o Coma > 6hours
- o Fits: > 10 fits (status epilepticus)
- o Oliguria or anuria

Differential diagnosis:

From other causes of: Convulsions and coma with pregnancy

- o Epilepsy
- o Intracranial hemorrhage
- o Hysteria.
- o Meningitis
- o Brain tumors.
- o Strychnine poisoning

Diagnosis of eclampsia:

A. Symptoms

- o Convulsion in a pregnant woman; should be suspected.
- o History of PET (usually)

B. Signs:

- o Sustained HPN > 160/110 mm Hg.
- o Generalized edema.
- o Proteinuria (heavy > 5 g)

- o Hyperreflexia, clonus
 - o Mental status changes, Localizing neurologic deficits.
 - o Papilledema
 - o Right upper quadrant abdominal tenderness
 - o Oliguria or anuria.
 - o Tachycardia, tachypnea, rales
- C. Investigation:
- o The same investigations of PET, plus
 - o CT brain:
 - o Cerebral edema.
 - o Cerebral hemorrhage
 - o Cerebral infarction
 - o MRI brain.
 - o Electroencephalography and CSF Studies

Treatment:

- 1) General and first aid measures:
 - o Isolation in eclampsia room: Single, quite, semi dark room.
 - o Ensure ABC: patent airway, breathing and circulation.
 - o Positioning: in left lateral position.
 - o Insert a catheter
 - o Observation: Every 30 minutes assess
 - o Pulse, BP and respiratory rate.
 - o Monitoring fluid intake and urinary output by urinary catheter.
 - o CBC including platelets, blood urea, creatinine, and liver enzymes/l2 hour. Coagulation profile PT ,PTT
- 2) Control of convulsions and prevention of further attacks: MgSO₄: (see before)
- 3) Control of hypertension: Antihypertensives (IV as before)
- 3) Termination of pregnancy (TOP):
 - o Timing of labor: 6 hours after the last fit.
 - o Method: as PET but:
 - In indications of C.S add retinal hemorrhage.
 - Continue MgSO₄ for 2 days.

Chronic hypertension during pregnancy

Diagnosis

History:

- Hypertension treated before pregnancy with various antihypertensive medication Renal problems
- Previous pregnancies may have been affected previous superimposed pre-eclampsia
- Previous IUFD, IUGR and abortions
- Family history of hypertension may be present

Symptoms and signs

- Usually symptomless
- Edema usually not present unless superimposed pre-eclampsia occurs

Examination

- Hypertension presenting before 20 weeks' gestation
- Cardiac enlargement may be present
- Edema usually occurs when pre-eclampsia or heart failure occurs as a complication of hypertension

Laboratory investigations

- Urine analysis: proteinuria usually indicates the occurrence of superimposed pre-eclampsia
- Renal function: serum creatinine, uric acid and BUN
- Fundus examination: detects changes associated with longstanding hypertension

Management

- Antihypertensive treatment:
 - Alpha methyldopa (Aldomet) (centrally acting drug); dose: 1-3 gm./day
 - labetalol;
 - Nifedipine
 - Atenolol (beta blockers)
- Termination of pregnancy if:
 - Fetal maturity reached
 - Fetal distress and severe IUGR
 - Additional complications occur (severe PET, abruptio placenta).

Anemia during pregnancy

LEARNING OBJECTIVES:

- To define and list different types of anemia during pregnancy
- To list fetal and maternal complications of anemia during pregnancy, labor and peripartum
- To mention the minimum allowed hemoglobin levels during pregnancy
- To describe the management of iron deficiency anemia and the role of routine iron supplementation.

Definition:

Anemia during pregnancy is diagnosed as an Hb concentration < 11 gm/dL (WHO) or if the Hct falls to < 30 %.

Hematological changes during pregnancy

- Plasma volume increases during pregnancy.
- This begins at 8-10 weeks' gestation and reaches peak levels at 32 weeks.
- The increase in plasma volume is larger than the rise in red cell volume.
- The net result is a drop in Hb and Hct levels. This is known as physiologic anemia of pregnancy.

Screening for anemia in pregnancy

Obtain a CBC, with Hb level and Hct value at the booking visit and repeat at 28 weeks' gestation.

Types of anemia in pregnancy

- Physiological anemia
- Dyshematopoietic anemia (inadequate red blood cell production).
 - Nutritional anemia (absent raw material).
 - Iron deficiency.
 - Megaloblastic anemia: folic acid deficiency and vitamin B 12 deficiency.
- Aplastic anemia.
 - Depression by irradiation or drugs renal failure.
 - Idiopathic.
 - Anemia secondary to infection e.g. UTI.
- Hemorrhagic anemia.
 - Acute, chronic blood loss.
- Hemolytic anemia

Effect of pregnancy on anemia:

- Pregnancy aggravates the pre-existing anemia.

Effect of anemia on pregnancy:

- Maternal
- Pregnancy: Increased risk of developing heart failure.
- Labor: Increased risk of inertia and PPH.
 - Puerperal: Increased risk of puerperal sepsis/defective lactation.
- Fetal
- Hypoxia,
- IUGR,
- Preterm delivery

Iron deficiency anemia

Incidence: Most common type of anemia encountered during pregnancy.

Metabolism and daily requirement of iron during pregnancy:

- In non-pregnant women:
Diet supplies 14 mg of elemental iron / day, of which only 1-2 mg is absorbed.
- In pregnant women:
 - The total requirement during pregnancy is about 1000 mg of elemental iron.
 - The daily requirement is 4 mg of elemental iron So, we should give supplementation 60 mg elemental Fe/day (300mg Fe sulphate)
 - Fe is absorbed in the 'ferrous' state in the presence of vitamin C. Phytate and phosphate decrease iron absorption

Pathophysiology of iron deficiency anemia

- The iron stores become depleted in an attempt to maintain the production of red blood cells (RBCs) and to satisfy the needs of pregnancy.
- Once iron stores become depleted, the molecules of transferrin become less than 15% saturated with iron.
- This leads to impaired erythropoiesis (microcytosis and hypochromia) and, ultimately, the production of RBCs by bone marrow will decrease.
- Iron deficiency anemia occurs in three stages:
 - Depletion of iron stores
 - Deficient erythropoiesis (without anemia)
 - Frank iron deficiency anemia

Etiology of iron deficiency anemia during pregnancy:

- Decreased intake:
 - Poor diet.
 - Severe morning sickness and vomiting
- Decrease absorption:
 - Vitamin C, proteins, phosphate and phytates.
 - Decreased gastric acidity and use of antacids.
 - Malabsorption syndromes and parasitic infestations

Increased demands:

- o Multiple pregnancy
- o Hemorrhage with pregnancy
- o Multi-parity

agnosis of iron deficiency anemia

Symptoms

- o Headache, fatigability,
- o Dyspnea and palpitation

Signs

- o Pallor; face, palm, nail bed and mucus membranes (non reliable sign).
- o Pulse; tachycardia, hyperdynamic circulation (water hammer pulse).
- o Mouth; Angular stomatitis and red glazed tongue.
- o Nails; brittle, striated with loss of their luster.
- o Spooning of the nails may occur in severe cases (Koilonychia).
- o Hemic murmurs; are heard during systole.

Investigations

- o CBC; reduced Hb and Ht values.
- o Blood film: picture of microcytic hypochromic anemia.
- o Iron indices;
 - Serum ferritin is < 10 ng/ml (N. 12-150 ng/mL)
 - The first abnormal test, it reflects depletion of iron stores provided that no inflammatory disease.
 - Transferrin saturation (Serum iron / TIBC) <15% (normally 30%).
 - A reduced serum iron (< 120 ug/ dl). Increased TIBC (> 350 ug/ dl)

Complications:

- **Maternal:** Occur in patients with severe anemia (Hb < 7 gm/dL).
 - o Abruptio placentae.
 - o PPH occurs more frequently in anemic patients.
 - o Puerperal sepsis
- **Fetal:**
 - o Increased incidence of pre-term labor
 - o Increased incidence of IUGR

Treatment:

- 1) Prophylactic treatment:
 - o Good pre-pregnancy nutrition
 - o Healthy and balanced diet during pregnancy.
 - o Every pregnant woman needs Fe supplementation (the earlier the better)
 - o Oral supplementation to all pregnant women after 1st trimester 30-60mg elemental Iron/day (300mg Fe sulphate)

2) Active treatment:

- o Oral ferrous sulfate 300 mg t.d.s supposed to increase HB by 1 gm/ per month.

Parenteral iron therapy:

- Indications:

- o Malabsorption
- o Intolerance to oral iron
- o Non-compliant patient
- o The need for rapid correction

- Dose: 250 mg of elemental iron for each gram of hemoglobin below normal.

- Route

IM (e.g., iron sorbitol; imferon : 250mg every other day)

IV infusion (e.g. iron sucrose at hospital due to possible complication.

S/E: pain and staining at the site of injection, hemosiderosis, and anaphylaxis.

Blood transfusion: no firm criteria for initiating packed RBCs transfusion, but it is usually required when Hb is < 6gm / dl.

Follow up and monitoring of results of treatment

- o Response to oral therapy is detected by an elevated reticulocytic count.
- o Treatment should be continued for three months after RBC indices are back to normal .
- o If iron is given as a prophylactic dose, it should be continued for the first three months postpartum.

Folic acid deficiency anemia

Physiological role of folic acid during pregnancy

- o Stimulate DNA synthesis.
- o Stimulate Cell growth, cell division.
- o Daily Requirement: 200-300 ug/day

Treatment:

- Prophylactic treatment:
 - o Every pregnant woman needs folic acid supplementation during pregnancy.
 - o Oral folic acid supplementation to all pregnant 400 mg/day.
- Active treatment:
 - o Oral 5 mg folic acid per day.

Coagulation disorders in pregnancy

LEARNING OBJECTIVES:

- To define and list different types of thromboembolic disorders during pregnancy
- To describe prophylaxis of thromboembolic disorders during pregnancy, labor and puerperium
- To describe the management of thromboembolic disorders during pregnancy, labor and puerperium.
- To list the causes and management of disseminated intravascular coagulation during pregnancy

Deep vein thrombosis (DVT)

Definition:

DVT is a condition in which a blood clot forms in one or more of the deep veins.

Venous thromboembolism (DVT & PE) is one of the leading causes of maternal mortality.

Risk factors for venous thromboembolism:

- Physiological changes that occur during pregnancy:
 - Hypercoagulability
 - Increased liver-synthesized coagulation factors
 - Increased platelet aggregation
 - Blood stasis
 - Decreased venous tone
 - Decrease of 50% in venous flow in lower extremities by the third trimester
- Pressure of the gravid uterus on pelvic veins
- Vascular trauma at delivery

Sites of venous thrombosis: Deep veins

- Calf veins
- Iliofemoral vein (most common site, left side more frequent)
- Pelvic veins (up until the inferior vena cava)
- Ovarian vein.

Clinical Picture and diagnosis

- History of prolonged labor and excessive manipulation during delivery.
- Leg swelling
 - Usually unilateral
 - Bilateral swelling in extensive pelvic vein thrombosis
- Hotness and cyanosis of the leg.
- Positive Homan's sign:
Calf pain on dorsiflexion of the foot but neither its presence nor absence is reliable.
- Symptoms suggestive of pulmonary embolism:

- **Dyspnea,**
- **Chest pain,**
- **Cyanosis,**
- **Hemoptysis and**
- **Collapse.**

Investigations

- Duplex Doppler is simple, non-invasive, and safe in pregnancy.
- Confirmation is by venography (contraindicated during pregnancy).
If the duplex test is negative in spite of a high level of clinical suspicion, the patient should be given anticoagulants and have the duplex test repeated after one week.

Management

1) Prophylactic treatment

- Early mobilization and physiotherapy
- Estrogens are no longer given to suppress lactation
- Anticoagulant prophylaxis for high risk cases;
 - High risk cases are,
 - Previous history of DVT or PE
 - Deficient antithrombin III, protein C or protein S
 - Antiphospholipid antibody syndrome
 - Prosthetic heart valves

2) Curative treatment

- First aid management
 - Insert an IV line
 - Ensure bed rest until symptoms resolve.
 - Elevate feet to reduce leg edema.
 - Compression stockings reduce leg edema.
- Anticoagulants:
 - 1) Unfractionated heparin
 - Preferred in patients:
 - Before surgery (shorter half-life and reversibility with protamine).
 - With renal impairment and patient weights > 150kg.
 - Dose:
 - Start with 10,000-15,000 units IV, followed by continuous IV infusion of 1000 units/hour or 15 to 20 U/kg/h.
 - Subcutaneous heparin: can be given instead of IV infusion in a dose of 10,000 units/12 hours.
 - The aim is to make the blood clotting time or partial thromboplastin time 1.5-2 times their normal values.

- Antidote:
 - Protamine sulphate 1% solution; 10 mg (1ml) for every 1000 units heparin is given by slow IV injection.

2) Low molecular weight heparin

- Enoxaparin and Dalteparan
- All subcutaneous administration
- Advantages:
 - Better than unfractionated heparin in decreasing the risk of mortality, recurrent thromboembolism, and hemorrhage.
 - Also it has more predictable therapeutic response, easy administration and monitoring, and less heparin-induced thrombocytopenia.
- Disadvantages: Cost and longer half-life compared to heparin.
- Excretion: Renal and therefore should not be used in patients with impaired RFT.

3) Oral anticoagulant

- Warfarin can be given orally to the postpartum non-lactating woman (not used in pregnancy).
- One exception is the use of warfarin after the first trimester in women with prosthetic heart valves.
- Controlled by:
 - Prothrombin time which should be 2-4 times the normal value (INR 2-3).
- Antidote:
 - Vitamin K1
 - 10-20 mg slowly IV

Pulmonary embolism

Pulmonary embolism (PE) is a fatal complication of DVT. In 10% of patients with PE death occurs within the first 60 minutes.

In 90% PE is diagnosed and treated in one-third of the patients and remains undiagnosed in two-thirds.

Diagnosis

- A. Symptoms:
 - Range from minimal disturbance to sudden collapse and death depending on the size, number and site of the embolism
 - Dyspnea, chest pain, cough, frothy blood stained sputum, hemoptysis, nausea, vomiting and sudden desire to defecate.
- B. Signs:
 - Mild pyrexia, tachycardia, tachypnea, cyanosis, raised jugular venous pressure, pleural friction rub, pleural effusion, right ventricular failure.

C. Investigations:

- ECG: inverted T waves and atrial arrhythmia
- D-dimer test: good negative test
- X-ray: opaque shadow (infarction), pleural effusion and raised costophrenic angles of diaphragm.
- Duplex of lower limbs as a source of the embolus
- Ventilation/Perfusion scan (V/Q scan)
- CT pulmonary angiography (CTPA)

Treatment:

- Rapid effective anticoagulation
 - Unfractionated heparin should be started immediately. Do not wait for diagnostic tests
 - Heparin doesn't dissolve the formed clot but it prevents embolization of the thrombi
- Supportive treatment
 - Give oxygen, even if the PO₂ level is normal, as the increased alveolar oxygen may help pulmonary vascular dilatation
 - Give IV fluids with caution and careful observation of the systolic and diastolic blood pressures
 - Give analgesic for pain
 - Digitalis for heart failure
 - Aminophylline 250-400 mg IV to relieve dyspnoea
- Pulmonary embolectomy:
Partial or total occlusion of the inferior vena cava by an umbrella filter or thrombectomy
- Streptokinase
 - Contraindicated during pregnancy, labor and early puerperium for fear of hemorrhage
 - Should be reserved for women with severe pulmonary thromboembolism with hemodynamic compromise

Disseminated intravascular coagulation (DIC)

Definition:

A hemorrhagic disorder that occurs following the uncontrolled activation of clotting factors and fibrinolytic enzymes resulting in tissue necrosis and bleeding.

Pathogenesis:

- Extensive tissues damage → release of thromboplastins → Consumption of the fibrinogen and other clotting factors in coagulation process.
- Fibrin stimulates fibrinolytic system and breaks fibrin and fibrinogen into FDP which have an anticoagulant effect aggravating hemorrhage and shock → ischemia

- Ischemia → more tissue damage (vicious circle).
- Predisposing factors:

- Abruptio placae.
- Amniotic fluid embolism.
- Endotoxic shock.
- Eclampsia and pre-eclampsia.
- Hydatidiform mole
- IUFD and missed abortion.
- Prolonged shock of whatever the cause.

Clinical features:

- Unexplained spontaneous bleeding from any site e.g.
 - Oozing of blood, bruising,
 - Epistaxis and hematuria,
 - Postpartum hemorrhage.

Investigations:

- Bed-side tests (Clot observation test):
 - 5-10 C.C. of blood in a test tube will be clotted normally within 10 minutes. In case of DIC no clot will be formed or a clot is formed but it undergoes dissolution within one hour in 37°C.
- Laboratory tests:
 - Plasma fibrinogen level: During pregnancy the normal level is 4-6 gm/L. Failure of coagulation occurs when its level drops to 1 gm/L.
 - Fibrinogen degradation products FDP: increased.
 - Platelet count: decreased.

Management:

- Treatment of the underlying cause.
- Fresh blood transfusion: contains clotting factors particularly F II, V and VIII.
- Fresh frozen plasma: contains 3 gm fibrinogen/L in addition to FV and VIII.
- Fibrinogen: 4-6 gm IV may be given if there is no fresh frozen plasma. However, it is not recommended as it may aggravate the coagulation process (fuel on fire)
- Heparin: to inhibit fibrin production and consumption of the clotting factors but it is contraindicated if there is current bleeding.
- Antifibrinolytic agents: as EACA, trasylol or tranexamic acid.

Liver disorders during pregnancy

LEARNING OBJECTIVES:

- To define and list different types of liver disorders during pregnancy
- To describe diagnosis of jaundices during pregnancy, labor and puerperium with emphasis on Intrahepatic cholestasis of pregnancy
- To describe the causes and management of acute fatty liver with pregnancy during pregnancy, labor and puerperium

Jaundice in pregnancy

Jaundice is the yellowish discoloration of skin, sclera and mucous membranes as a clinical manifestation of hyperbilirubinemia.

Etiology:

- Pregnancy related
 - HELLP syndrome
 - IHC of pregnancy
 - AFL of pregnancy
 - II. gravidarum
- Pregnancy associated hemolytic anemia:
 - Autoimmune hemolysis
 - Cell wall; spherocytosis
 - IIb: thalassemia
- Hepatocellular
 - Viral hepatitis
 - Drug induced hepatitis
 - Obstructive
 - Gall bladder stone
- Cancer head of pancreas

Intrahepatic cholestasis of pregnancy

Definition:

Pruritus with onset in pregnancy (commonly 3rd trimester), associated with abnormal liver function in the absence of other liver disease, that resolves following delivery.

Incidence:

1:1000 pregnancies. It is the most common liver disorder unique to pregnancy.

Etiology:

- High risk group;
 - Advanced maternal age.
 - Multiparous women.

- o Twins and IVF pregnancies.

Genetic: Common in South America e.g. Chile and Bolivia.

- Hormonal; Excess estrogen and impaired progesterone metabolism.

Complications:

- Fetal: PTL, fetal distress and sudden IUGR.
- Maternal: postpartum hemorrhage.
- A recurrence rate of approximately 70% has been reported.

Diagnosis:

- Pruritus:
 - o It usually occurs in third trimester.
 - o Pruritus; without rash
 - o Appear after 30 weeks and disappear within 2 days postpartum.
 - o Start at periphery then toward center.
 - o Exaggerate at night.
- Jaundice:
 - o A mild jaundice may develop.
 - o Usually appear 4 weeks after pruritus.
- Others:
 - o Chills,
 - o Abdominal pain,
 - o Diarrhea, and
 - o Steatorhea are uncommon finding.

Differential diagnosis:

- Viral hepatitis and gallbladder disease.

Investigations:

- Bile acid; increase to 10 folds (deoxycholic and chenodeoxycholic acids)
- Bilirubin; Elevated total bilirubin, and mostly direct.
- Enzymes; Elevation in serum alkaline phosphatase.
- Moderate elevation in serum aminotransferase activity
- Prolonged prothrombin time
- Elevated serum bile acid with pruritus is diagnostic.

Management:

- Symptomatic;
 - o Antihistamines and soothing lotion.
 - o UDCA (Ursodeoxycholic acid) 1 gm/d. (drug of choice).
- Obstetric Management:
 - o CTG weekly to assess fetal condition
 - o Labor should be induced at term or when fetal lung maturity confirmed.
 - o Earlier delivery may be indicated if the condition deteriorated
- After delivery, symptoms usually disappear within 2 days.

- Oral contraceptives should be used cautiously because cholestasis may develop postpartum when OCP are taken.

Acute fatty liver with pregnancy

Definition:

Liver failure in late pregnancy, usually of unknown cause

Incidence:

It is rare, 1: 10,000.

Etiology:

Risk factors:

- Advanced maternal age
- Nulliparity
- Male fetus
- Disease; pre-eclampsia and history of AFLP
- Underweight women.

Causes:

It may be related to inherited defects in mitochondrial beta-oxidation of fatty acids which is an autosomal recessive disorder and the heterozygous LCHAD deficiency has been identified in some women with AFLP.

Deficiency of the third enzyme, long-chain 3-hydroxyacyl-CoA dehydrogenase (LCHAD) results in accumulation of medium- and long-chain fatty acids with liver failure.

Complications:

- Gastrointestinal bleeding
- Renal failure
- Coagulopathy and DIC.
- Hypertension/preeclampsia/HELLP
- Infections
- Pancreatitis
- Hypoglycemia.
- Fetal complications:
 - PTL
 - fetal distress
 - IUFD.

Clinical findings:

It usually occurs in third trimester with Jaundice, upper abdominal pain, preeclamptic symptoms.

- Nausea, vomiting, fever, headache and pruritus.
- The end result is acute liver failure.

Differential diagnosis:

- Drug-Induced Hepatotoxicity
- Hepatitis, Viral
- Eclampsia
- Preeclampsia
- HELLP Syndrome
- Toxicity, Acetaminophen (Reye)

Investigation:

- Thrombocytopenia and neutrophilia
- Coagulopathy.
- Hypoglycemia.
- Hyperbilirubinemia < 5 mg/dl, Transaminases < 1000 IU/L (normal ALP in majority of cases)
- Hyperuricemia and elevated creatinine serum level
- Liver biopsy is diagnostic, showing the characteristic picture of micro vesicular fatty infiltration of hepatocytes.

Management:

- ICU admission
- Stabilization, correct disorders e.g. hypoglycemia, DIC.
- Termination of pregnancy
- No specific treatment has proved successful except early delivery because after delivery the condition resolves with complete recovery (may rarely take up to 4 weeks).
- Postpartum care
- Conservative management usually beneficial.
- If not improved or complicated with hepatic encephalopathy, transport to liver unit.
- Liver transplantation in irreversible conditions.

Pre-eclamptic liver disease and HELLP syndrome

Hepatic dysfunction has long been recognized with preeclampsia and HELLP syndrome (Hemolysis Elevated Liver Enzyme Low Platelet) which complicates 5% of pre-eclamptic and 20% of eclamptic patients.

Diagnosis:

- Diagnostic criteria of preeclampsia plus:
- Microangiopathic hemolytic anemia
- Total bilirubin 1.2 mg/dL
- Platelet count < 100,000 cells/ml
- Serum LDH > 600 IU/L
- Serum AST > 70 IU/L
- Women who did not meet all of the above were considered to have partial HELLP syndrome.
- Investigations:
 - CBC pictures of hemolysis and thrombocytopenia.
 - Abnormal coagulation profile is rare
 - Hyperbilirubinemia and abnormal liver enzymes.

Complications:

- Placental abruption
- ARF, pulmonary edema and
- Liver hematoma/rupture.

Management:

- Urgent delivery and there is currently insufficient evidence to support the use of adjunctive steroids to reduce maternal and perinatal mortality and major morbidity

Prognosis:

- Perinatal mortality rate is 20%, Prematurity in 70%
- Maternal mortality associated with HELLP is about 2%.
- Risk of recurrence in future pregnancies is up to 6%.
- Lab abnormalities may still worsen up to 48 hours postpartum but and improve later.

Thyroid diseases with pregnancy

Hyperthyroidism

LEARNING OBJECTIVES:

- To define and list different types of thyroid gland disorders during pregnancy
- To describe diagnosis of thyrotoxicosis during pregnancy, labor and puerperium
- To describe the causes and management of postpartum thyroiditis

Incidence: 2:1000 pregnancies.

Causes:

- Causes of Thyroid gland;
 - Grave's disease,
 - Diffuse hyperplasia and hypertrophy of thyroid gland
 - Hyperactive (toxic) nodules of thyroid gland.
 - Silent thyroiditis.
- Ectopic secretion of thyroid hormones;
 - Uterine causes: GTD.
 - Ovarian causes: Strauma ovarii

Clinical presentation:

- Symptoms:
 - Weight loss despite a good appetite, diarrhea
 - Heat intolerance, tremors,
 - Resting pulse > 100 bpm, heart failure (Toxic myocarditis).
 - Enlarged thyroid gland with audible bruit.
 - Eye = lid lag, exophthalmos.
- Clinically, diagnosis is difficult to make in pregnancy because mild maternal tachycardia, weight loss, heart murmurs and heat intolerance are all symptoms in early pregnancy.
- Investigations:
 - TSH -low.
 - Free T3 and free T4 are elevated

Complications:

- Abortion and preterm labor
- Fetal hyperthyroidism (Antibodies crossing placenta)
- Face or brow presentation due to a large fetal goiter
- Thyroid crisis might occur with fever, marked tachycardia, dehydration and prostration (maternal death occurs in 25% of cases).

Management:

1) Medical treatment:

- Antithyroid drugs:
 - Carbimazole
 - Propyl thiouracil, to keep the mother euthyroid
 - They may result in - maternal granulocytopenia
 - Fetal goiter & hypothyroidism (breastfeeding is contraindicated).
- β -blockers,
- Atenolol (Tenormin)- to control the symptoms of hyperthyroidism while waiting for the antithyroid drug to take effect.
- 2) Surgery:
- Partial thyroidectomy is indicated if,
 - Drug allergy or poor response to the antithyroid drugs;
 - Tracheal compression.
- 3) Radioactive iodine is contraindicated as it completely obliterates fetal thyroid gland.

Hypothyroidism

Incidence: 3/1000 pregnancies

Causes:

- Iodine deficiency is a rare condition
- Autoimmune Hashimoto's thyroiditis.
- Treated hyperthyroidism
- Surgery, radioactive iodine, or drugs
 - Women treated with radioactive iodine frequently require T4 supplements.
 - The dose should be checked in early pregnancy to ensure appropriate levels of FT4 & FT3.

Clinical presentation

- Mental and physical sluggishness.
- Decreased ankle jerk.
- Weight gain, myxedema.
- Cold intolerance, constipation.
- Dry skin, dry and brittle hair

Investigations:

- High TSH
- Free T3 and free T4 are reduced.
- Thyroid function tests should be performed serially in each trimester.

Complications:

- Abortion and preterm labor
- Intrauterine growth restriction and fetal death

- Maternal iodine deficiency is associated with development of cretinism in the newborn as a result of congenital hypothyroidism.

Management:

- Levothyroxine (T4), continue with the same pregestational dose
- Breast-feeding is not contraindicated.

Postpartum thyroiditis

Etiology:

An autoimmune disorder of unknown cause

Incidence:

2-5% of the postpartum women

Clinical Features:

- The patient presents with a hyperthyroid state 3-6 months postpartum, followed by a hypothyroid state which is usually transient lasting up to 3 months.
- Investigations:
 - High T₃ and T₄ levels (excessive release of the hormones from the destroyed follicles).

Management:

- It is usually a self-limiting condition.
- In thyrotoxic phased b-blockers as Atenolol (Tenormin) may be used.
- In hypothyroid phased thyroxine can be given for 4-6 months.

Prognosis:

- Although this is often a self-limiting condition, many will suffer.
- Recurrence after a subsequent pregnancy
- Persistent hypothyroidism in these women

Vomiting with pregnancy

LEARNING OBJECTIVES:

- To list different causes of vomiting during pregnancy
- To describe the differences between emesis gravidarum and hyperemesis gravidarum and their management

Etiology:

- Pregnancy related
 - Emesis gravidarum
 - Hyperemesis gravidarum
 - Disrupted ectopic pregnancy
 - Vesicular mole
 - Acute polyhydramnios
 - Acute fatty liver of pregnancy
 - Complicated Preeclampsia
 - Placental abruption
 - Start of labor pains (some women)
- Genitourinary tract disorders
 - Pyelonephritis
 - Uremia
 - Kidney stones
- Gynaecological causes
 - Degenerating uterine leiomyoma
 - Torsion of subserous fibroid
- Gastrointestinal disorders
 - Gastroenteritis
 - Pancreatitis
 - Appendicitis
 - Peptic ulcer disease
 - Intestinal obstruction
 - Hepatitis
 - Biliary tract disease
- Metabolic disorders:
 - Diabetic ketoacidosis
 - Addison's disease
 - Hyperthyroidism

- Neurologic disorders
 - Central nervous system tumors
 - Pseudo tumor cerebri
 - Vestibular lesions
 - Migraine headaches
- Drug toxicity or intolerance

Morning sickness of pregnancy (Emesis gravidarum)

Definition:

Actual vomiting in the morning (Start between 4-6th weeks of pregnancy and improves or disappears about the 12th week. Nausea is felt by about 50% of pregnant women on getting up in the morning.

Etiology:

- Effect of β -hCG
- An increase in progesterone relaxes the stomach muscles with GERD

Treatment:

- Reassurance
- Diet regulation
- Low frequent diet (light 3 meals with snacks in-between)
- Increase CHO content and decrease fat content
- Drugs:
 - anti-histaminics
 - anti-emetics
 - Vitamin B6 (Pyridoxine)

Hyperemesis gravidarum

Definition:

Hyperemesis gravidarum: Vomiting is not confined to the morning, repeated throughout the day until it affects the general condition of the patient.

Incidence: 1:500 pregnancies.

Etiology:

The following theories were postulated:

- Hormonal: the most accepted theory
 - High hCG stimulates the chemoreceptor trigger zone in the brain stem including the vomiting center.
 - Higher frequency of the conditions where the hCG is high as in vesicular mole, and multiple pregnancy.
- Allergy: to the corpus luteum or the released hormones.

- Deficiency of:
 - Adrenocortical hormone and/or
 - Vitamins B6 and B1
- Nervous and psychological: due to
 - Psychological rejection of an unwanted pregnancy
 - Fear of pregnancy or labor so it is more common in primigravidae.

Pathological changes:

These are the same as in prolonged starvation:

- Liver: small fatty infiltration. Hyperbilirubinemia (due to liver damage)
- Kidney: fatty degeneration of the convoluted tubules
- Heart: small subendocardial and subepicardial hemorrhages
- Brain: congestion and petechial hemorrhages in the brain stem resembling that of Wernicke's encephalopathy
- Eye: optic neuritis and retinal hemorrhage
- Blood: Hypervolemia and haemoconcentration
- Hypernatremia, hypokalemia and hypochloraemia
- Oliguria, albuminuria, ketonuria.

Diagnosis:

Symptoms:

- The patient cannot retain anything in her stomach
- Vomiting occurs through the day and night even without eating
- Thirst, constipation and oliguria
- In severe cases, vomitus is bile and/or blood stained.
- Finally, there are manifestations of Wernicke's encephalopathy as drowsiness, nystagmus and loss of vision then coma.

Signs:

- Manifestations of starvation and dehydration:
 - Loss of weight
 - Sunken eyes
 - Dry tongue
 - Inelastic skin.
 - Pulse: rapid and weak pulse.
 - Low blood pressure,
 - Temperature: slight rise.

Differential diagnosis:

Other causes of vomiting as:

- Cholecystitis, appendicitis, pyelonephritis, gastroenteritis and gall bladder diseases,
- Complicated ovarian tumors

Management

- Mild case without dehydration can be treated as an outpatient.
 - Diet: small, frequent, semisolid, CHO, fat and proteins, ample fluids intake.
 - Anti-emetics.
 - If not responding admit to the hospital.
- Severe cases:
 - Hospitalization:
 - Intravenous fluids:
 - NPO (nothing per oral) for 24-48 hours
 - Correct fluid and electrolyte imbalance
 - After control of vomiting, frequent gradual small carbohydrate meals are started.
 - Drugs:
 - Adrenocortical preparations
 - Anti-emetics: Cortigen B6, metoclopramide (Primperan), pyridoxine hydrochloride and Vitamin B1.
 - Anti-histaminics that have antiemetic effect
 - Phenothiazine (chlorpromazine largactil) 5-10 mg three times daily has a tranquillizer and antiemetic effect.
 - Observation for:
 - Vomiting: frequency, amount, color and contents
 - Vital signs: pulse, temperature and blood pressure.
 - Fluid: intake and output.
 - Urine analysis: specific gravity, albumin, ketone bodies, chloride and bile pigments.
 - Blood: urea, electrolyte and liver function tests.
 - Eye: examination of the fundus.
 - Termination of pregnancy: Rarely indicated e.g.
 - Severe persistent vomiting unresponsive to all measures
 - Jaundice
 - High blood urea, oliguria or anuria
 - Wernicke's encephalopathy
 - Retinal hemorrhages.

Urinary tract infection with pregnancy

LEARNING OBJECTIVES:

- To define asymptomatic bacteruria and describe its management
- To describe the diagnosis and management of pyelonephritis during pregnancy
- To describe the management of pregnancy after renal transplantation.

Asymptomatic bacteruria

Definition:

It is the presence of 100,000 organisms per ml of the same species in two cultured fresh mid-stream specimens of urine (absence of symptoms)

Incidence:

2-5% of pregnant women

If not treated 30% of them will develop symptomatic infections.

Complications:

- Symptomatic infections as cystitis and pyelonephritis
- Anemia
- Hypertension
- Intrauterine growth restriction
- Pre-term delivery.

Treatment:

- Ampicillin or cephalosporin 500 mg / 6 hours for 10 days or
- Nitrofurantoin, 100 mg / 6 hours.

Pyelonephritis

Definition:

It is inflammation of the renal pelvis and parenchyma.

Incidence:

1% in pregnant women and up to 30% in cases with asymptomatic bacteruria

Predisposing factors during pregnancy:

- Urine stasis due to:
 - Compression of the ureter by the gravid uterus against the pelvic brim particularly on the right side.. So infection is more common on the right side
 - Relaxation of the ureter by progesterone effect
- Increased urinary excretion of:
 - Glucose and
 - Amino acids favor the growth of bacteria.

Causative organisms:

- Escherichia coli (E. coli) (90%).
- Klebsiella, streptococcus, staphylococcus, proteus, pseudomonas and others

Diagnosis

- Symptoms: Usually appears after 16 weeks in the form of: Malaise, anorexia, nausea and vomiting, rigors, dysuria, urgency and frequency of micturition, renal pain commonly on the right side.
- Signs: Fever reaching 40°C, rapid pulse, tenderness in one or both renal angles (costovertebral angle).
- Investigations:
 - Urine analysis:
 - Pus cells, organisms and proteins
 - Casts and RBCs may be present.

N.B. Presence of organisms without pus cells suggests contamination, while pus cells without organisms suspect tuberculosis.

- Urine culture and sensitivity
- Blood picture: leucocytosis.
- Differential diagnosis:
 - Causes of acute abdomen as appendicitis and abruptio placentae
 - Causes of vomiting.

Complications:

- Abortion,
- IUGR
- Intrauterine fetal death, or
- Premature labor
- Chronicity: with recurrent infections.
 - Plain X-ray and intravenous pyelography (IVP) should be done after delivery to exclude urinary stones.
 - Chronic pyelonephritis may result in hypertension and renal failure later on.

Treatment

- Bed rest, light diet and plenty of fluids
- Analgesics and antipyretics
- Alkalines: as potassium citrate to inhibit the growth of E. coli.
- Antibiotics: as ampicillin 500 mg/ 6 hours, nitrofurantoin 100 mg/6 hours, or cephalosporins 500 mg/6 hours are started until the result of culture and sensitivity is obtained.
- Treatment is continued for 7-10 days.

Pregnancy after renal transplantation

Effect of pregnancy on the mother: Increased risk of:

- UTI,
- PIH and
- Anemia (erythropoietin deficiency)

Effect of transplantation on pregnancy:

- Increased risk of abortion, IUGR, CFMF
- Fetal lymphopenia
- Malpresentation and unengaged head (position of the transplanted kidney).

A woman with transplanted kidney should fulfill the following criteria to get pregnant:

- Proper interval after implantation (at least a 1-year).
- Graft function should be stable,
- Serum creatinine less than 1.4 mg/dl.
- Proteinuria is less than 1 g per day.
- Blood pressure controlled below 140/90 mmHg.
- Follow up with both nephrologist and obstetrician.
- More frequent ANC visits;

*Mode of delivery is based on obstetric indications.

High risk pregnancy

LEARNING OBJECTIVES:

- To define high risk pregnancy and list risk factors
- To describe management of high risk pregnancy
- To enumerate methods of antepartum assessment of fetal well being
- Identify patient with high risk pregnancies in antenatal clinics.

Definition: it is the pregnancy in which the mother, fetus and/or newborn are at higher risk of morbidity or mortality during pregnancy, labor and/ or postpartum period.

Incidence: About 20% of all pregnancies.

Causes:

1. Maternal factors:

- Age: below 16 years or above 35 years particularly if the patient is primigravida.
- Grand multiparity: 5 or more previous deliveries.
- Habits: as heavy smoking, alcoholism or drug addiction. Bad obstetric history:

 - Repeated abortion
 - Repeated preterm labor
 - Prolonged or difficult labor particularly if was ended by stillbirth or neonatal death.
 - Operative delivery as caesarean section or forceps

- Medical disorders:
 - Hypertension
 - Diabetes
 - Cardiac
 - Renal, pulmonary and hepatic
 - Anemia
 - Coagulation defects, Hemoglobinopathies
 - Serious infections as AIDS
- History of surgery or trauma:
 - Myomectomy
 - Metroplasty
 - Pelvic trauma

2. Fetal factors

- Malpresentations and malpositions
- Multiple pregnancy
- Antepartum hemorrhage
- Congenital anomalies
- Premature rupture of membranes
- Rh-isoimmunization

- Intrauterine growth restriction
- Macrosomia
- Poly or oligohydramnios

Management:

- Management of the cause.
- Monitoring of fetal well-being (see later)
- Delivery in a well-equipped hospital under senior staff supervision

Elderly primigravida

Definition: A primigravida whose age is above 35 years.

Danger: This woman is more liable to:

- Hypertension with pregnancy
- Abruptio placentae
- Higher incidence of fibroid with pregnancy
- Post-term pregnancy
- Uterine inertia and prolonged labor
- Rigid perineum so instrumental delivery is more needed
- More cesarean section delivery as the fetus is precious.

The grand multipara

Definition: Woman who had 5 or more previous deliveries.

Danger: This woman is more liable to:

- Anemia
- Hypertension with pregnancy
- Diabetes
- Placenta previa
- Pendulous abdomen
- Malpresentation and malposition
- Uterine inertia and prolonged labor
- Instrumental delivery and caesarean section are more needed.
- Obstructed labor which may lead to rupture uterus.
- Postpartum hemorrhage.

Retroverted gravid uterus

During pregnancy the following may occur:

- Spontaneous correction:

Occurs in the majority of cases at around the 12th week

- Incarceration:

Occurs usually around 14-16 weeks where the uterus continues to grow posteriorly in the pelvis and its fundus is below the promontory of the sacrum. This may be due to:

- Jutting promontory
- Pelvic adhesions
- Posterior wall fibroid.

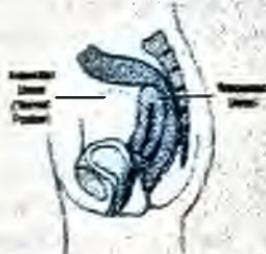
- Abortion:

May occur around 14-16 weeks due to:

- Congestion of the uterus, and
- Stretching of the internal os as the body of the uterus is unable to expand to accommodate the pregnancy.

- Anterior sacculation:

If the incarceration is not relieved the anterior part of the lower uterine segment distends to accommodate the growing pregnancy. This may lead to rupture of the uterus.



Clinical picture:

A. Symptoms:

- Urinary symptoms: Frequency then difficulty which may progress to acute retention of urine due to elongation and compression of the urethra.
- Pain: may be due to bladder distension, pressure on pelvic organs or abortion.

B. Signs:

The cervix is high and directed anteriorly,

The body of the uterus is felt in Douglas pouch as a soft mass.

Differential diagnosis

- Ovarian cyst with pregnancy
- Posterior wall fibroid with pregnancy
- Pelvic haematocele.

Management

- Prophylactic:

- Avoid over distension of the bladder.
- Frequent prone position.
- Examine the patient during 14-18 weeks if spontaneous correction was not occur, manual correction is advised.

- **Curative.**
 - Slow evacuation of the bladder and leave Foley's catheter to keep it empty.
 - Place the patient in prone or Sims' position.
 - These usually succeed to correct the retroversion, if fail do manual correction with or without anesthesia.

Pendulous abdomen

Definition: it is marked weakness of the anterior abdominal wall leading to forward falling of the pregnant uterus to overhang the symphysis pubis.

Predisposing factors:

- Grand multiparity which causes laxity of the abdominal wall
- Contracted pelvis
- Increased lumbar lordosis

Complications:

- Discomfort to the patient
- Malpresentations and non-engagement
- Premature rupture of membranes and prolapse of the cord
- Prolonged labor
- Obstructed labor and rupture uterus.

Management:

- Abdominal binder
- Exclude disproportion and maintain the dorsal position during labor.
- Ventouse, forceps or breech extraction may be used in prolonged labor to direct the presenting part in the pelvis.

Anatomy of the female pelvis

LEARNING OBJECTIVES:

- To describe the anatomy of pelvic inlet, cavity and outlet
- To list the diameters of the pelvis and their obstetric importance

The female bony pelvis is divided into a false and a true pelvis separated by the pelvic brim.

1- False pelvis (above the pelvic brim): of no obstetric importance

2- True pelvis (below the pelvic brim): concerned with childbirth



False and true pelvis

The true pelvis:

- The true pelvis is the bony canal through which the fetus must pass during birth.
- It is composed of inlet, cavity and outlet.

I- The pelvic inlet (pelvic brim):

The brim is round except where the sacral promontory projects into it.

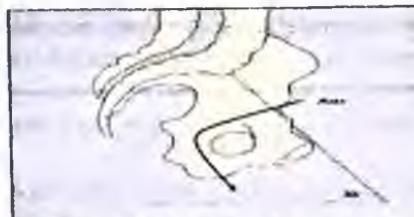
- The promontory and wings of the sacrum forms its posterior border, the iliac bones form its lateral borders and the pubic bones form its anterior border.

Boundaries:

- 1) Sacral promontory
- 2) Sacral ala or wing
- 3) Sacro-iliac joint
- 4) Ilio-pectineal line
- 5) Ilio-pectineal eminence and upper border of superior pubic ramus
- 6) Pubic tubercles
- 7) Upper inner border of the body of the pubic bone (pubic crest)
- 8) Upper inner border of the symphysis pubis

Pelvic Inclination:

The plane of the pelvic inlet makes an angle 55° with the horizon in the standing position.



Pelvic Inclination

Diameters of the pelvic inlet

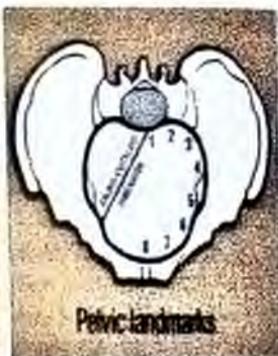
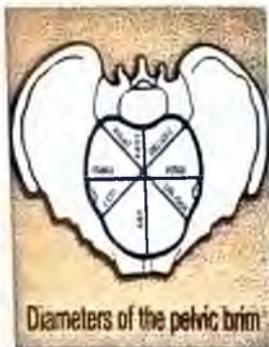
Antero-posterior diameters:

- Anatomical antero-posterior diameter (true conjugate):
 - From the tip of sacral promontory to the upper border of the symphysis pubis
 - 11 cm measured by radiological pelvimetry
 - Contracted pelvis is classified into degrees according to this diameter.
- Obstetric antero-posterior diameter (obstetric conjugate).
 - From the tip of sacral promontory to the most bulging point in the back of the symphysis pubis (1 cm below its upper border)
 - 10.5 cm measured by radiological pelvimetry
 - It is the shortest antero-posterior diameter, which confronts the head as it passes through the plane of pelvic inlet
- Diagonal conjugate diameter:
 - From the lower border of the symphysis pubis to the tip of sacral promontory
 - 12.5 cm measured clinically by vaginal examination
- External conjugate diameter:
 - From the depression below the tip of 5th lumbar spine to the upper border of the symphysis pubis
 - 20 cm measured from outside by Martin's pelvimeter

Transverse diameters:

- Anatomical transverse diameter:
 - Between the two farthest points on the ilio-pectineal line
 - 13 cm.
 - It is 4 cm. posteriorly from the promontory and 7 cm. from the symphysis pubis.
 - Contracted pelvis is classified into degrees according to this diameter.
- Obstetric transverse diameter:
 - Bisects the true conjugate
 - 12.5 cm.

- **Oblique diameter:**
 - From the sacro-iliac joint to the opposite ilio-pectineal eminence.
 - The right from the right joint to the left eminence and vice versa
 - 12 cm.
- **Sacro-cotyloid diameter**
 - From the promontory of the sacrum to the right or left ilio-pectineal eminence
 - 9.5 cm.



The Pelvic cavity:

It is bounded by:

- Above: the pelvic brim
- Below: the plane of least pelvic dimensions
- Anteriorly: symphysis pubis
- Posteriorly: sacrum

The planes of the pelvic cavity

- * Also known as *the plane of mid cavity or plane of greatest pelvic dimensions* which passes through:
 - Anteriorly: the middle of the posterior surface of symphysis pubis
 - Posteriorly: the junction between 2nd and 3rd sacral vertebrae
 - Laterally: It passes to the center of the acetabulum and upper part of the greater sciatic notch
 - It is round with all diameters = 12.5 cm.

Clinical significance:

- Internal rotation occurs when the biparietal diameter of the head occupies this wide plane of the pelvis.
- Disimpaction of the head to this plane is done before manual rotation of the head in cases of occipito-posterior position.

The pelvic outlet:

Two outlets are described: anatomical and obstetrical.

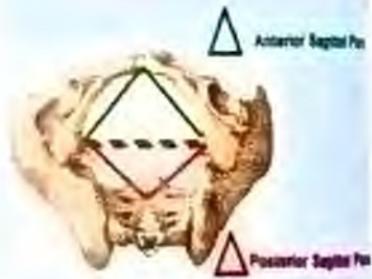
I - The anatomical outlet:

- It is lozenge-shaped bounded by lower border of symphysis pubis, pubic arch, ischial tuberosity, sacro-tuberous and sacro-spinous ligaments and tip of coccyx.
- The anatomical outlet is divided by the bituberous diameter into two triangular planes:
 - Anterior sagittal plane
 - Apex, the lower border of the symphysis pubis
 - Base, Bituberous diameter
 - Lateral border, pelvic arch
 - Posterior sagittal plane
 - Apex, tip of the coccyx.
 - Base, bituberous diameter
 - Lateral border, sacro-tuberous, sacro-spinous ligaments

II The obstetric outlet:

- It is a segment bounded below by anatomical outlet and above by the plane of least pelvic dimensions (the plane of obstetric outlet).
- The plane of least pelvic dimension passes through
 - Anteriorly: lower border of the symphysis pubis.
 - Posteriorly: tip coccyx.
 - Laterally: ischial spines.

The Plane of the Outlet



Diameters of the pelvic outlet:

Antero-posterior diameters:

- Anatomical antero-posterior diameter
 - From the lower border of the symphysis pubis to the tip of the coccyx
 - 11 cm.
- Obstetric antero-posterior diameter
 - From the lower border of the symphysis pubis to the tip of the sacrum
 - 13 cm.
- Anterior sagittal diameter:
 - From the lower border of the symphysis pubis to the center of bituberous diameter
 - 6-7 cm.

Pelvic outlet

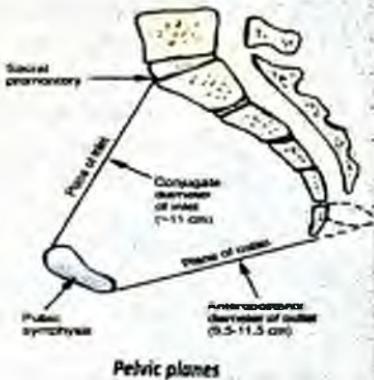
- Posterior sagittal diameter:
 - From the center of bituberous diameter to the tip of sacrum
 - 7-10 cm.

Transverse diameters:

- Anatomical transverse "Bituberous" diameter:
 - Between the inner aspects of ischial tuberosity
 - 11 cm.
- Obstetrical transverse "Bispinous" diameter:
 - Between the tips of the ischial spines
 - 10.5 cm.

Thom's dictum:

The sum of bituberous and posterior sagittal diameter must exceed 15 cm to allow an average sized head to pass provided that the bituberous diameter > 8 cm.



The pelvic planes:

- Plane of pelvic inlet (pelvic inclination).
- Plane of mid-cavity (plane of greatest pelvic dimensions).
- Plane of obstetric outlet (plane of least pelvic dimensions).
- Anterior sagittal plane.
- Posterior sagittal plane.

The pelvic axis:

- Anatomical axis (curve of Carus):
 - It is imaginary line joining the centre points of the planes of the inlet, cavity and outlet.
 - It is C-shaped with the concavity directed forwards. It has no obstetric importance.

Obstetric axis (J-shaped):

It passes downwards and backwards along the axis of the inlet up to the level of ischial spine where it passes downwards and forwards along the axis of pelvic outlet (corresponding to the direction taken by the head in its passage through the pelvis).



Clinical importance of the level of ischial spines:

In obstetrics:

- The plane of least pelvic dimensions (plane of obstetric outlet) is at this level.
- It gives origin to the levator ani muscles (main pelvic floor muscle).
- The head is considered engaged when the bony part of the vault of the skull (vertex) is felt vaginally at this level.
- Internal rotation of the head occurs when the occiput is at this level.
- Obstetric axis of the pelvis changes its direction at this level.
- It is a landmark (ischial spine) for pudendal nerve block.
- Forceps should only be applied when the vertex is felt at or below this level.

In gynecology:

- The external os of the cervix is normally felt at this level. If the external os descend below it, it means the presence of uterine prolapse.
- The vaginal vault is approximately at this level.
- Ring pessary for treatment of prolapse should be introduced above this level.
- The pelvic ureter changes its course from downwards and laterally to downwards and medially at this level.

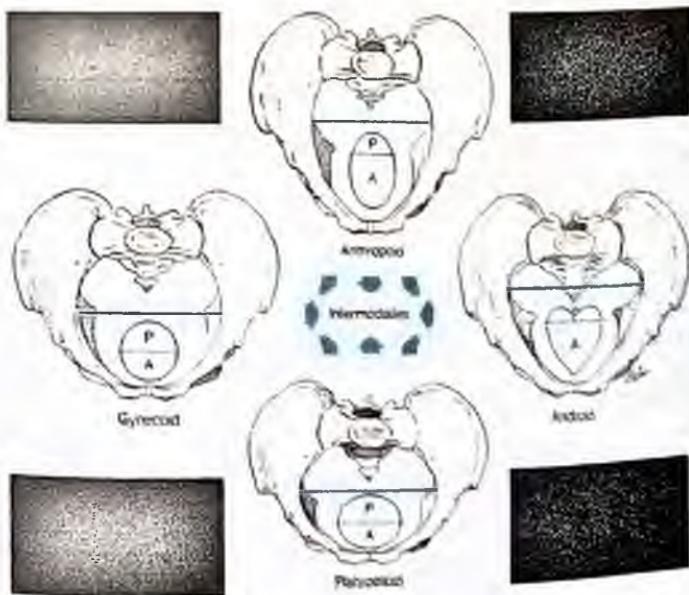
Shape of the female pelvis:

According to radiological studies, 4 basic types of female pelvis are described (*Caldwell and Maloy classification*).

- Gynecoid pelvis (50%)
- Android pelvis (20%)
- Anthropoid pelvis (25%)
- Platypelloid "flat" pelvis (5%)

Pelvic type	Gynecoid pelvis	Android pelvis	Anthropoid pelvis	Platypelloid "flat pelvis"
Incidence	(50%)	(20%)	(25%)	(5%)
Pelvic inlet:				
Shape	transverse oval or circle	Heart-shaped	Longitudinal oval	Transverse oval
Widest transverse diameter	12 cm	12 cm	Short, <12 cm	Long (12 cm)
Antero-posterior diameter	11 cm	11 cm	Long >12 cm	Short (10 cm)
False-pelvis		Narrow	Divergent	Straight
Mid cavity:				
Sacro-sciatic notch	Wide	Narrow	Wide	Narrow
Ischial spines	Not projecting	Projecting	Not projecting	Not projecting
Side-wall	Parallel	Converging	Parallel	Parallel
Pelvic outlet:				
Subpubic angle	Wide (90-100°)	Narrow (< 70°)	Narrow	Wide
Sacrum	Short and concave	Long and shallow	Long and narrow	Short

Shape of the female pelvis



Anatomy of the fetal skull

LEARNING OBJECTIVES:

- To describe the anatomy the fetal skull and its components.
- To list the diameters of the fetal skull and their obstetric importance.

- It is divided into face, base and vault.
- The bones of the base and the face are firmly united and therefore incompressible and no moulding occurs in them.
- The vault is compressible due to the presence of sutures separating its bones.

Bones of the vault:

There are five main bones in the vault of the fetal skull.

1. The occipital bone

- Lies at the back of the head and forms the region of the occiput.
- Part of it contributes to the base of the skull as it contains the foramen magnum which protects the spinal cord as it leaves the skull.
- At the center is occipital protuberance.

2. The two parietal bones

- Lie on either side of the skull.
- The ossification center of each is called the parietal eminence.

3. The two frontal bones

- Form the forehead or *sinciput*.
- At the center of each is a frontal bone or frontal eminence. The frontal bones fuse into a single bone by 8 years of age.

4. In addition to these five, the upper parts of the two temporal bones are also flat and form a small part of the vault.

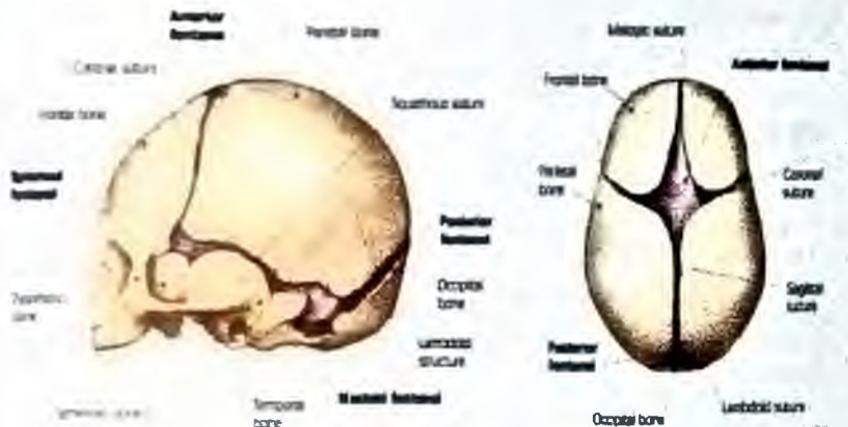
Sutures and fontanelles:

Sutures are cranial joints and are formed when 2 bones join. Where 2 or more sutures meet, a fontanelle is formed.

The sutures of fetal skull:

- The lambdoidal suture is shaped like the Greek letter lambda (λ) and separates the occipital bone from the two parietal bones.
- The sagittal suture lies between the two parietal bones.
- The coronal suture separates the frontal bones from the parietal bones, passing from one temple to the other.

- The frontal suture runs between the two halves of the frontal bone.



Fetal skull showing regions and landmarks of obstetrical importance

- The two temporal sutures separate the temporal bone from the frontal, parietal and occipital bones on either side of the skull.

The fontanelles of fetal skull: (6 fontanelles)

- Anterior fontanelle or Bregma
 - Posterior fontanelle or Lambda
 - Two lateral temporal fontanelles
- Two lateral temporal fontanelles:
 - At the anterior and posterior ends of the temporal sutures on each side.
 - They have no obstetric importance.
 - The obstetric importance of anterior fontanelle and posterior fontanelle:
 - Diagnosis of vertex presentation.
 - Determination of the position of the occiput.
 - Detection of the degree of flexion of the head.

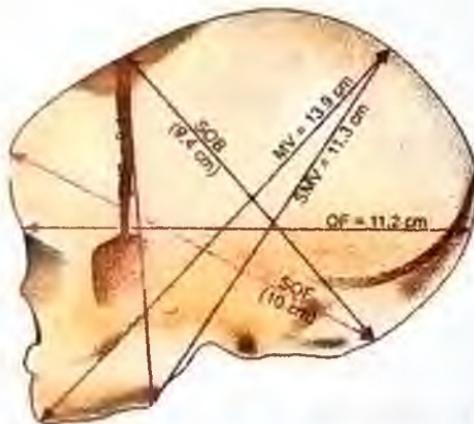
Anterior fontanelle (Bregma)	Posterior fontanelle (Lambda)
Large	Small
Lozenge-shaped	Triangular
Membranous floor	Bony floor
Surrounded by 4 bones (2 frontal and 2 parietal).	Surrounded by 3 bones (2 parietal and occipital)
Formed by meeting of 4 sutures	Formed by meeting of 3 sutures
Surrounding bones do not override with moulding (Because they are widely separated)	Surrounding bones override with moulding (One parietal bone overrides the other and both overrides the occipital bone)
Floor is completely ossified at 15 years after birth	Floor is completely ossified at full term.

Diameters of fetal skull

A) Longitudinal diameters:

- Sub-occipito-bregmatic (SOB)
 - 9.5 cm
 - From below the occipital protuberance to centre of the anterior fontanelle
 - It is the engaging diameter in Occipito-Anterior (OA) with complete fixation of the head
- Suboccipitofrontal (SOF)
 - 10 cm.
 - From below the occipital protuberance to the anterior end of the anterior fontanelle (Bregma)
 - It is:
 - The engaging diameter in OA with incomplete flexion of the head
 - The diameter that distends the vulva in OA if the head is allowed to extend after crowning
- Occipitofrontal (OF):
 - 11.5 cm
 - From the occipital protuberance to the root of the nose
 - It is:
 - The engaging diameter in occipito-posterior (OP) as the head is deflexed
 - The diameter that distends the vulva in face to pubis delivery in OP
 - The diameter that distends the vulva if the head is allowed to extend before crowning in OA

- **Submentobregmatic (SMB):**
 - 9.5 cm.
 - From the junction of the chin and neck to the center of Bregma
 - It is the engaging diameter in face presentation when the head is completely extended.
- **Submentovertical (SMV):**
 - 11.5 cm
 - From the junction of the chin and neck to the Vertical point (a point on the sagittal suture midway between anterior and posterior fontanelle)
 - It is:
 - the engaging diameter in incompletely extended face.
 - the diameter that distends the vulva during face delivery
- **Mentovertical (MV)**
 - 13.5 CM.
 - From the tip of chin to the Vertical point
 - It is the engaging diameter in brow presentation; it is more than largest diameter of the brim. So, the head cannot enter the pelvis in brow presentation.



Diameters of fetal skull

B) Transverse diameters:

- **Biparietal diameter (BPD):**
 - 9.5 cm
 - Between the two parietal eminences
 - It is the largest transverse diameter and the head is said to be engaged if BPD passes the plane of the pelvic inlet.

- Superparietal subparietal diameter :
 - 9 cm.
 - From above one parietal eminence to below the opposite eminence
 - It is the engaging diameter in asynclitism.
- Bitemporal diameter:
 - 8 cm
 - Between the anterior ends of temporal sutures
- Bi mastoid diameter:
 - 7.5 cm
 - Between the tips of mastoid processes
 - It is not crushed during craniotomy operation.

Relationship of the fetus to the uterus and pelvis

This relationship determines which part of the fetus will enter the pelvic brim first, and governs the mechanism by which the fetus will pass through the birth canal.

Lies:

- Definition: Relation between the longitudinal axis of the fetus to that of the mother
- Types:
 - Longitudinal lie (99.5%) as in cephalic or breech presentation
 - Transverse lie (0.5%) as in shoulder presentation



Breech Vertex

Longitudinal lie

Oblique lie

Transverse lie

The oblique lie is midway between longitudinal and transverse.

It is called unstable lie because it converts into longitudinal or transverse lie.

Attitude:

Definition: The relation of the fetal parts to each other.

This usually refers to the position of the head with regard to the trunk.

It may be:

- o Complete flexion:
 - It is the usual attitude.
 - It occurs in vertex presentation.
- o Deflection:
 - In occipito posterior position
- o Complete extension:
 - In face presentation.
- o Military attitude:

Midway between flexion and extension

It occurs in brow presentation.

Presentation:

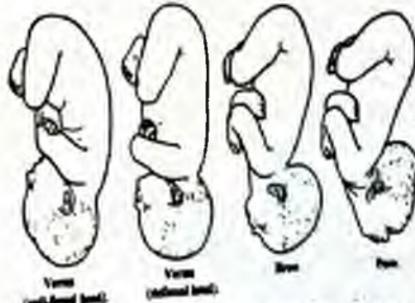
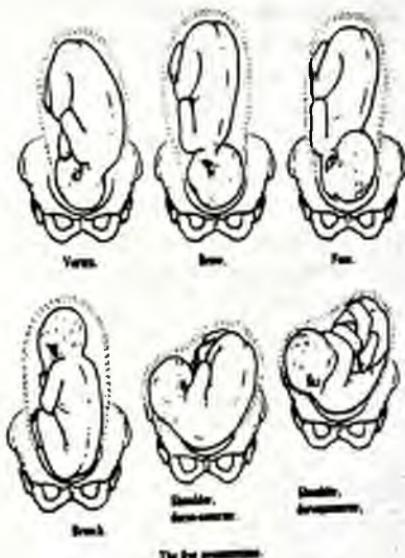
The part of the fetus related to the pelvic brim and first felt by vaginal examination.

Types:

- Cephalic (96%):
 - o Vertex when the head is flexed.
 - o Face when the head is extended
 - o Brow: the head is midway between flexion and extension.
- Breech (3.5%).
- Shoulder (0.5%).

Variation of cephalic presentation

- The vertex: It is the area of the vault bounded:
 - o Anteriorly: anterior fontanelle and coronal suture
 - o Posteriorly: posterior fontanelle and lamboid suture
 - o Laterally: 2 line passing by the parietal eminences
- The face: the area from the junction of the chin and neck to the root of the nose and supra orbital ridges.
- The brow: the area from the root of the nose and supra orbital ridge to the anterior fontanelle and coronal suture.



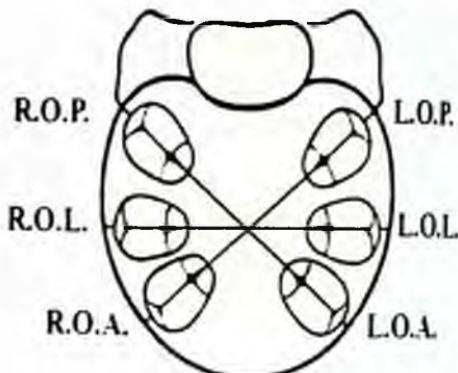
- Cephalic presentation is more common than other presentation
 - Adaptation theory: the larger breech lies in the wide fundus while the smaller head is adapted in the smaller lower segment of the uterus.
 - Gravitation theory: As the head is heavier than breech and so by gravity, it comes to occupy LUS.

Fetal presentations

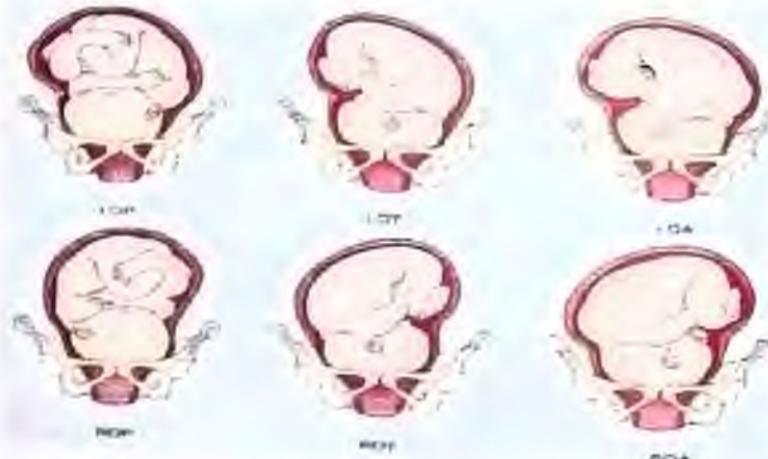
Position:

It is the relation between the denominator and maternal pelvis. There are 8 positions of the occiput. There are 4 common classical positions:

- 1st position (LA):
The back is left and anterior 60%.
- 2nd position (RA):
The back is right and anterior 15%.
- 3rd position (RP):
The back is right and posterior 20%.
- 4th position (LP):
The back is left and posterior 5%.



Common positions



The denominator:

It is a landmark on the presenting part used to determine the position of the fetus during labor.

- Occiput in vertex presentation.
- Chin in face presentation
- Sacrum in breech presentation
- Frontal bone in brow presentation
- Scapula in shoulder presentation

During labor, if we palpate the denominator vaginally and according to its position in the maternal pelvis we have 8 positions:

- Left Anterior (LA): The denominator is felt towards the left obturator foramen (anteriorly)
- Left Transverse (LT): The denominator is felt towards the midpoint of the left iliopectineal line.
- Left Posterior (LP): The denominator is felt towards the left sacro-iliac joint.
- Right Anterior (RA): The denominator is felt towards the right obturator foramen.
- Right Transverse (RT): The denominator is felt towards the midpoint of the right iliopectineal line.
- Right Posterior (RP): The denominator is felt towards the right sacro-iliac joint.
- Direct Anterior (DA): The denominator is felt towards the symphysis pubis.
- Direct Posterior (DP): The denominator is felt directly towards hollow of the sacrum.

In vertex presentation, there are 8 positions of the occiput: LOA, LOT, LOP, ROA, ROT, ROP, DOA and DOP.

- Occipito-anterior is more common than occipito-posterior.
 - 1- The concavity at the front of the fetus in OA as its flexion fits into the convexity of the vertebral column (the lumbar lordosis) at the back of the mother.
 - 2- The placenta is more common on the posterior wall of the uterus (the baby usually faces the placenta)
- LOA is more common than ROA and ROP is more common than LOP.

In LOA and ROP, the head enters the pelvis in the right oblique diameter which is more favorable than the left oblique because:

 - 1- The colon reduces the length of the left oblique
 - 2- Anatomically; the right oblique is usually slightly longer than the left oblique.

Engagement:

Definition: It is the passage of the widest transverse diameter of the presenting part through the plane of the pelvic inlet.

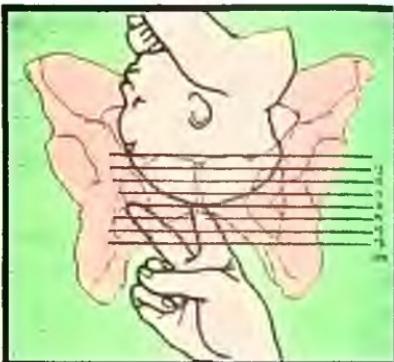
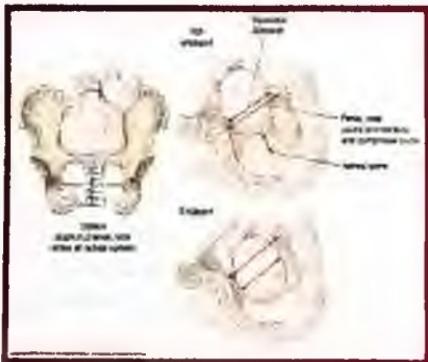
The widest transverse diameter is:

- o Biparietal diameter in cephalic presentation 9.5 cm
- o Bi trochanteric diameter in breech presentation 10 cm

Detection:

Vaginally:

- The vertex is felt at or below the ischial spines.
- The engaged head can't be easily grasped by 1st pelvic grip but it can be palpated by 2nd pelvic grip.

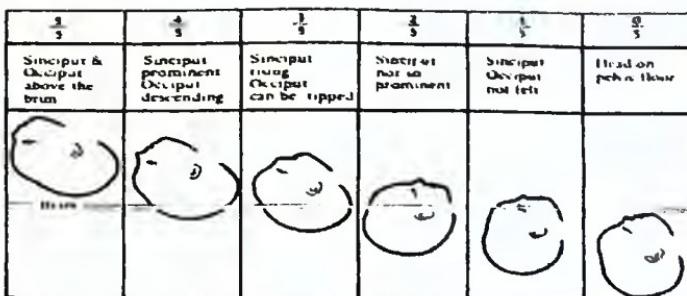


Stations of the fetal head in relation to the pelvic canal

- ✓ If the lowest part of the vertex is felt vaginally at the level of ischial spines, we consider this station 0, if it is one cm lower, it is called +1, 2 cm = +2, 3 cm = +3.
- ✓ If the vertex is one, two or three cm above the level of the ischial spines, it is called -1, -2 or -3 respectively.

Abdominally:

- Engagement of the fetal head is usually measured in fifth.
- The amount of the fetal head palpable above the brim of the pelvis is assessed and described in fifth.



Descent of the fetal head estimated in fifths palpable above the pelvic brim

Timing:

- In primigravida, engagement of the head occurs in the last 3 or 4 weeks of pregnancy due to tonicity of the abdominal and uterine muscles.
- In multipara, engagement usually occurs at the onset of labor or even at the beginning of the 2nd stage of labor.

Causes of non-engagement of the head:

- Occipito-posterior position.
- Disproportion (contracted pelvis)
- Polyhydramnios
- Multiple pregnancy (twins)
- Placenta previa
- Pelvic tumors e.g. fibroid
- Malpresentation as the face and brow presentation
- Hydrocephalus
- Full bladder or rectum
- Atony of the abdominal muscles

Synclitism and asynclitism

Synclitism: When the two parietal bones are at the same level

Asynclitism: One parietal bone is at a lower level than the other due to lateral inclination of the head and the sagittal suture lies nearer to the sacral promontory or symphysis pubis.

Types according to German classification:

- Anterior parietal bone presentation (Naegel's obliquity or Varnier's obliquity):
 - The anterior parietal bone is lower and the sagittal suture is near to the sacral promontory.
 - It occurs in multigravidae due to laxity of the abdominal wall (pendulous abdomen) and in contracted flat pelvis, as the jutting sacral promontory prevents the descent of the posterior parietal bone.

- **Posterior parietal bone presentation (Lizmann's obliquity):**
 - The posterior parietal bone is lower and the sagittal suture is near to the symphysis pubis.
 - It occurs in primigravidae due to tense abdominal wall.

Obstetric significance of asynclitism:

- Asynclitism brings shorter diameter to enter the pelvis supra-parietal subparietal 9 cm instead of biparietal 9.5cm.
- Slight degree of asynclitism may occur in normal labor.
- Anterior parietal bone presentation is more favorable than post- parietal bone presentation because:
 - During correction of asynclitism, the head meets only the resistance of the sacral promontory while in posterior parietal bone presentation the head meets the resistance of the whole length of the symphysis pubis.
 - In anterior parietal bone presentation, the head lies more in the direction of pelvic axis.
 - The anterior wall of the lower uterine segment becomes more stretched in posterior parietal bone presentation with liability to rupture.



Normal labor

LEARNING OBJECTIVES:

- To define normal labor and its stages
- To describe the mechanism of delivery of the fetal head and shoulder
- To describe the steps of proper management of normal labor

Labor: It is the process by which a fetus, placenta and membranes are expelled through the birth canal after the 24th week of gestation.

Normal labor: The diagnosis of normal labor is made in retrospect when it had fulfilled the following:

- spontaneous onset,
- expulsion of a single mature living fetus,
- presenting by the vertex,
- through the natural birth canal,
- within a reasonable time,
- without any interference (except episiotomy) and
- Without complications to the mother or the fetus.

Preterm labor: When the duration of pregnancy is between the end of 24 and the end of 37 weeks.

Post term labor: When the duration of pregnancy is 42 weeks or more.

Prolonged labor: Duration of labor lasting > 24 hours.

Precipitate labor: Duration of labor lasting < 3 hours

Causes of the onset of labor:

The exact cause of the onset of labor remains uncertain but, it would appear to be multifactorial in origin, being a combination of hormonal and mechanical factors:

- Prostaglandin (PGs) theory
- Fetal cortisol theory
- Estrogen-progesterone theory
- Mechanical stimulation of the cervix and the uterus
- Uterine distension theory
- Estrogen-oxytocin theory
- Placental ischemia (oxytocin-oxytocinase theory) (not accepted)



Formation of lower uterine segment

Forces of labor:

There are two forces responsible for labor:

- Uterine contraction and retraction
- Auxiliary forces of labor

Uterine contraction and retraction (true labor pains):

Characters of uterine contractions:

- Regular
- Involuntary

Uterine contractions of labor are involuntary and independent of extra-uterine control (out of control of CNS). Paraplegic pregnant patients have a normal course of labor and the uterus of a fully anesthetized patient can expel the fetus.

- Intermittent

Uterine contractions of labor are intermittent, with periods of relaxation between contractions to:

- Avoid fetal hypoxia
- Temporarily relieve pain
- Avoid muscle fatigue
- Increase in frequency, intensity and duration
 - Uterine contractions of labor start infrequent (every 10-20 minutes), weak (10-20 mmHg) and of short duration (10-20 seconds)
 - Gradually increase in their frequency, intensity and duration until finally recur every few minutes and last from one to two minutes.
 - With established labor, there are 3 contractions every 10 minutes; each lasts 50-60 seconds and the intrauterine pressure is 50-60 mmHg.

Frequency means the time needed for recurrence of next contraction.

Intensity means the pressure on the uterine contents exerted by each contraction.

Duration means the time each contraction lives.

- Painful: Uterine contractions of labor are painful; hence they are called labor pains.

The causes of pain are:

- Hypoxia of the contracted myometrium as in angina pectoris

- Compression of the nerve ganglia by interlocking muscle fibers
- Stretching of the cervix during dilatation
- Stretching of the covering peritoneum.

- Coordination:

The muscle fibers of the upper uterine segment contract together to get a good force.

- Fundal dominance:

- Each uterine contraction starts in the fundus near one of the cornu and spreads across and downwards.
- The contraction lasts longest in the fundus where it is also most intense but the peak is reached simultaneously over the whole uterus and the contraction fades from all parts together.
- This pattern permits the cervix to dilate and the strongly contracting fundus to expel the fetus.

- The contraction are followed by retraction:

- Uterine contraction of labor is accompanied by retraction.
- Retraction means permanent shortening or incomplete relaxation of uterine muscle fibers.
- As the consequence of retraction, the upper uterine segment becomes thicker and smaller.

Effects:

- Dilatation of the cervix
- Expulsion of the fetus
- Separation of the placenta
- Expulsion of the placenta
- Control of placental site bleeding
- Help involution of the uterus

Polarity: The uterus during labor shows the phenomenon of polarity (the upper segment is more active and the lower segment is more passive so as to dilate the cervix and expel the fetus).

(2) **Auxillary forces of labor:**

- Consists of voluntary bearing down effort brought about by strong contractions of the diaphragm and abdominal muscles.
- When the head stretches the pelvic floor, bearing down occurs involuntary by a reflex mechanism.

Importance of bearing down:

- 1- **First stage:** Has not effect on cervical dilatation.
- 2- **Second stage:** It helps expulsion of the fetus.
- 3- **Third stage:** Expulsion of separated placenta

Clinical course of labor

(1) The prodromal stage (prelabor):

During the last weeks of pregnancy, the women will have experienced a number of changes in preparation for labor.

- **Shelving (in standing position):**

The fundus of the uterus descends slightly, falls forwards, it brings the fetus in the direction of the axis of the pelvis.

- **Lightening (after engagement):**

This means a relief of upper abdominal pressure symptoms as dyspnea, palpitation and dyspepsia. The symphysis pubis widens and the pelvic floor becomes more relaxed and softened, allowing the uterus to descend further into the pelvis.



Lightening: The dotted line shows the shape of the uterus prior to labour.

- **Pelvic pressure symptoms (after engagement):**

- Frequency of micturition
- Difficulty in walking
- Rectal tenesmus

- **Increased vaginal discharge due to:**

- Pelvic congestion
- Increased estrogen

- **False labor pain (Braxton-Hick's contraction):**

Intermittent uterine contractions associated with variable degree of pain

Diagnosis of the onset of labor:

- **True labor pains**

	True labor pain	False labor pain
Onset	Starts with the onset of labor.	Starts before the onset of labor.
Pain	Painful	Not painful
Regularity	Regular	Irregular at long intervals
Intensity	Increase in strength, frequency and duration	Remains the same intensity
Site of discomfort	Back and abdomen	Abdomen only
Effect of sedation	Not relieved by analgesic.	Relieved by analgesic
Effect on fore water	Accompanied with bulge of bag of fore water	No bulge of bag of fore water
Effect on the cervix	Accompanied with cervical dilatation	No cervical dilatation

- **The show:**

The expelled cervical mucus tinged with blood

- The mucus comes from the cervical plug and the cervical glands which secrete excessively at this time.
- The blood arises from rupture of small vessels due to separation of the lower part of the bag of membrane from the lower uterine segment.



- **Dilatation of the internal os:**

- Under the effect of labor pains, the cervix is taken up and becomes shortened, with internal os wider than the external os, due to stretching of the lower segment
- In multipara the cervix may admit one or two fingers before the onset of labor

- **Formation of the bag of fore-waters**

- In normal labor, the head sits in the lower uterine segment and so, the amniotic sac is divided into

- Bag of hind-waters above the girdle of contact
 - Bag of fore-waters below the girdle of contact

- The effect of separation of the fore waters is to prevent the pressure applied to the hind-waters during uterine contraction from being applied to the fore-waters and keeps the membranes intact during the first stage (ball valve mechanism)

- After full cervical dilatation, the hind and fore-water become continuous and the pressure in the fore-water increases resulting in rupture of the fetal membranes

- Under the effect of uterine contraction and retraction which cause stretching of the lower segment and dilatation of the cervix, the lower pole of the fetal membrane gets detached and bulges into the cervical canal forming the bag of waters

- A finger passed through the cervix during pains feels the bag convex and tense

Stages of labor:

These are essentially 3 stages followed by a 4th stage of early post partum observation:

- **First stage (stage of cervical dilatation)**

- Starts with onset of labor and ends when the cervix is fully dilated (10 cm).
 - Its duration is 6-8 hours in multipara and 10-16 hours in nullipara

- **Second stage (stage of fetal expulsion)**

- Begins with complete dilatation of the cervix and ends with fetal delivery
 - Duration is 1-1.5 h in multipara and 1-2 h in nullipara

- Third stage (stage of expulsion of the placenta, cord and fetal membrane or stage of delivery of the placenta):
 - starts with delivery of the fetus and ends with delivery of the placenta.
 - Duration is about "10-30 minutes".
- Fourth stage:

It is the period of 2 hours immediately after delivery of the placenta to guard against postpartum hemorrhage.

Physiology of the first stage of labor (stage of cervical dilatation)

Definition: The first stage of labor begins with the onset of true labor pains and ends when the cervix is fully dilated (about 10 cm diameter or 5 fingers and with fully cervical dilatation the whole birth canal is felt as one continuous canal).

Durations: 10-16 hours in primigravida.
 6-8 hours in multipara.

Factors affecting cervical dilatation:

- Contraction and retraction of the uterus
- Contractions and retractions also push the bag of fore waters before rupture of the membranes or the presenting part after rupture of the membranes through the cervix helping in its dilatation (Fergusson's reflex).
- The changes in the cervix during pregnancy (glandular hypertrophy, edema and increased vascularity) make the cervix more readily dilatable.
- Prostaglandin release.

Cervical dilatation consists of 2 processes:

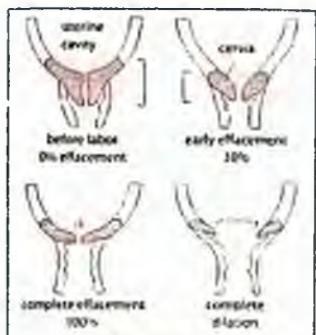
- A. Effacement or taken up of the cervix
- B. Dilatation of the external os

Mechanism of cervical dilatation:

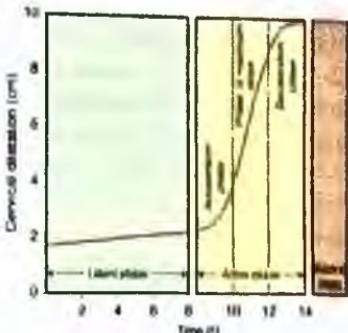
Effacement or taken up of the cervix:

- In primigravida, the internal os dilates at first and the cervical canal becomes opened up from above downwards and becomes incorporated into the lower uterine segment so that the cervix becomes thin and the external os only remains undilated. This is called taken up or effacement of the cervix and is followed by dilatation of the external os.
- In multipara, effacement and dilatation of the cervix occur simultaneously.

Dilatation of the external os:



Cervical effacement



Characteristics of the average cervical dilatation curve for nulliparous labor

Pattern of cervical dilatation:

There are two phases:

1. Latent phase (1-3 cm):

- Dilatation of the cervix tends to be quite slow until the os is about 3 cm dilated.
- This period may last for 6-8 hours in a primigravida and is known.

2. Active phase:

- Dilatation is subsequently more rapid and the cervix should dilate at a rate of 1-1.5 cm per hour.
 - Acceleration phase (3-5 cm)
 - Maximum acceleration phase (5-9 cm)
 - Deceleration phase (9-10 cm)

Friedman's cervicograph:

- Cervicograph is the diagrammatic representation of the dilatation of the cervix charted against the hours in labor.
- If the woman's cervical dilatation curve extends 2 hours to the right of the curve, labor is considered prolonged and acceleration of labor by amniotomy with a syntocynon infusion.

Physiology of the second stage of labor (stage of expulsion of the fetus)

- The second stage of labor begins when the cervix is fully dilated and ends with complete expulsion of the fetus from the birth canal.
- It is short but full of events with 2 main hazards of hypoxia and trauma.

Duration:

The second stage of labor lasts 1-2 hours in primigravida and ½-1 hour in multipara.

Physiological changes:**A- Uterine action:**

- There is continued, progressive contraction and retraction of the upper uterine segment while the lower segment and the cervix passively dilates and thins.
- The membranes often rupture spontaneously at the onset of the second stage.

B- Soft tissue displacement:

- As the hard fetal head descends, soft tissues of the pelvis become displaced.
- The fetal head becomes visible at the vulva, advancing with each contraction and receding during the resting phase until crowning takes place and the head is born.
- The shoulders and the body follow with the next contraction.

Mechanism of normal labor:

- During the mechanism of normal labor, the fetus turns slightly to take the advantage of the widest available space in each plane of the pelvis.
- The widest diameter of the pelvic brim is the transverse diameter while antero-posterior diameter is the widest one of the pelvic outlet.

Delivery of the head:**1) Descent:**

It is a continuous movement through the process of delivery brought about by

- Uterine contraction and retraction.
- Fetal axis pressure:

After rupture of membranes the force of uterine contractions is applied directly over the fetal body and transmitted along the fetal axis to the head.

- Auxiliary forces of voluntary bearing down

2) Engagement:

The head normally engages in the oblique or transverse diameter of the pelvic inlet.

3) Increased flexion:

- This occurs when the vertex meets the pelvic floor.
- This movement is explained by the lever theory
 - According to the lever theory the head represents a two-armed lever of unequal length.
 - The long arm of the lever extends from the sinciput to the atlanto-occipital joint and the short arm extends from the occiput to the atlanto-occipital joint.
 - So, when the head meets the resistance of the pelvic floor, the long arm (sinciput) will ascend, the short arm (occiput) will descend resulting in increased flexion.

- Increased flexion results in:
 - The smallest longitudinal diameter (the suboccipito-bregmatic) (9.5 cm) passes through the birth canal. If the head is incompletely flexed, its longitudinal diameter that passes through the birth canal is the suboccipitofrontal diameter (10 cm).
 - The occiput will meet the pelvic floors preparatory to the next movement of internal rotation.
 - The part of the head applied to the maternal passages is like a ball will equal longitudinal and transverse diameters suboccipito-bregmatic = Biparietal = 9.5 cm and the circumference of such ball is about 30 cm
- 4) Internal rotation:
 - This is a specific movement, which carries the anterior-posterior diameter of the head, from the oblique (a transverse) diameter of the pelvic cavity to the relatively wider anterior posterior diameter of the pelvic outlet
 - When the occiput meets the pelvic floor first (after increased flexion), it undergoes internal rotation $\frac{1}{8}$ of a circle so it becomes opposite the symphysis pubis. As head undergoes internal rotation, shoulders only partly rotate but are always behind by 45°.
 - The exact cause of internal rotation is still uncertain. Many explanations are given, of which the following are most popular
 - The gutter shape and slope of the pelvic floor
 - The pelvic floor is directed downwards, forwards and medially, anything that touches this floor moves in this direction. As the occiput is lower than the sinciput in a flexed head, it moves forwards behind the symphysis pubis.
 - The rising action of the bony pelvis.
 - At the pelvic inlet the largest available diameter is the oblique one but at the pelvic outlet the antero-posterior is the largest diameter & this will act as a screw action rotating the occiput anterior
- 5) Extension:
 - The sub occipital region passes beneath the symphysis pubis, and then by a movement of extension of the head, the rest of the vertex, forehead, face and lastly the chin sweep over the perineum and emerge outside the vulva
 - Extension occurs because the head is acted upon by two forces
 - Uterine contraction (downwards, forwards)
 - Pelvic floor resistance (upwards, forwards)
 - Extension is the movement by which the head is delivered in normal labor
- 6) Restitution:

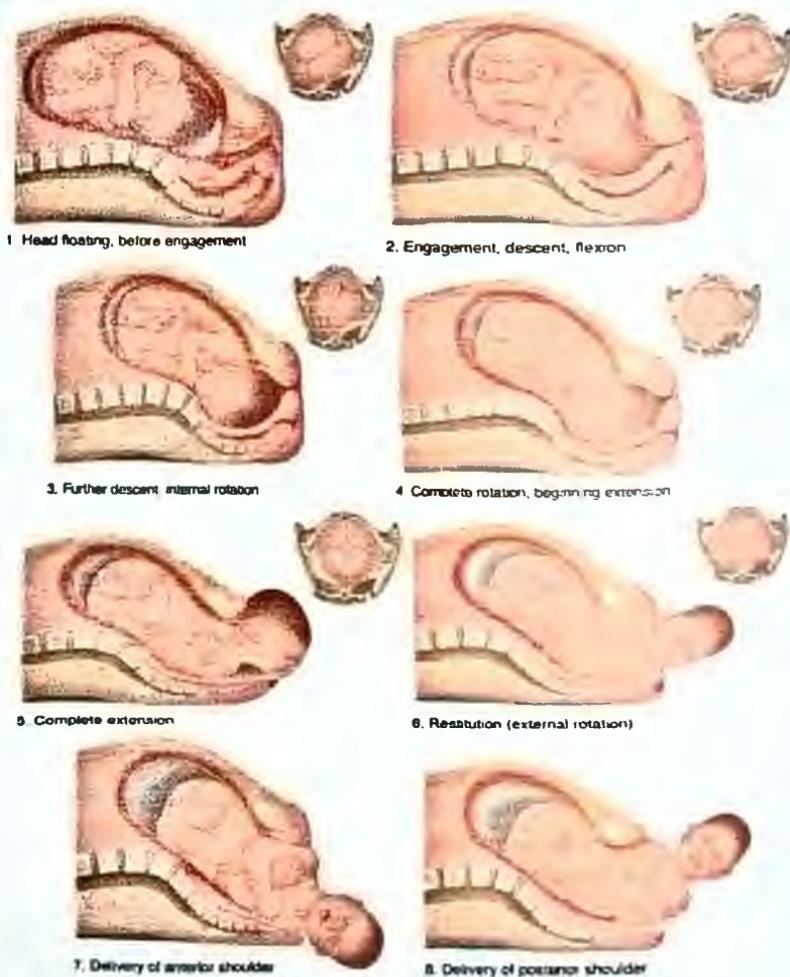
It is a movement of untwist, where the head after delivery moves one eighth of a circle in the opposite direction of internal rotation to correct the twist of the head on the body produced by internal rotation.

7) External rotation of the head:

Rotation of the occiput one eighth of a circle in same direction as restitution. It is due to internal rotation of the anterior shoulder.

8) Delivery of the shoulders and the body:

The anterior shoulder hinges below the symphysis pubis and the posterior shoulder is delivered by lateral flexion of the spine followed by the anterior shoulder then the body is delivered.



Mechanism of normal labor

Physiology of the third stage of labor

Definition:

It is the stage of separation, descent and expulsion of the placenta and fetal membranes.

Duration: 10-30 minutes.

Phases of the 3rd stage:

1. Separation of the placenta
2. Descent of the placenta into the lower uterine segment and upper vagina
3. Expulsion of the placenta from the vagina

After fetal delivery, the uterus becomes smaller and retraction continues. So, the placental site diminishes, meanwhile the inelastic placenta is unable to shrink.

Mechanisms of placental separation:

1) Schultze mechanism (80%):

- Placenta starts separation centrally and is delivered like inverted umbrella with the fetal surface presenting followed by the membranes containing small retro-placental clot.
- There are less blood loss and less liability to retained fragments.

2) Matthews and Duncan (20%):

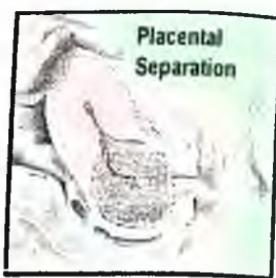
- The placenta starts separation at its lateral border and is delivered side ways (maternal surface first) presenting by its lower edge.
- There are more blood loss and more liability to retained fragments.

After placental separation, the uterus contracts strongly forcing placenta and membrane to fall into the lower uterine segment and into the vagina.

Hemostasis:

- 1- Contraction and retraction of the interlocking oblique muscle fibers of the upper uterine segment exert pressure on the torn vessels as clamps, so securing a ligature action.
 - 2- Following separation a vigorous uterine contraction brings the walls into apposition so that further pressure is exerted on the placental site.
 - 3- Transitory activation of the coagulation and fibrinolytic systems during and immediately following placental separation
- This protective response is especially active at the placental site and clot formation in the torn vessels is intensified.

- Following separation, the placental site is rapidly covered by a fibrin mesh utilizing 5-10% of the circulating fibrinogen. This secures hemostasis.



The fourth stage

It is a period of two hours immediately following delivery of the placenta.

during which most complications including;

- PPH
- Uterine inversion
- Hematoma formation
- The aim of management is to:
- Examine the placenta, membranes and umbilical cord for any anomalies and any lost part.
- Guard against postpartum hemorrhage

Management of normal labor

LEARNING OBJECTIVES:

- To describe the management of normal labor at its different stages
- To describe the required maternal and fetal monitoring during labor
- To describe the different types of analgesia and anesthesia used in labor.

Initial assessment:

History:

- Age, parity and first day of last normal menstrual period
- Previous deliveries (spontaneous or induced, prolonged or precipitate, vaginal or CS)
- History suggesting obstetric or medical problem e.g. diabetes, hypertension and antepartum hemorrhage
- Onset of true labor pain
- Gush of fluid and its color

General examination of the patient:

- Pulse, temperature, blood pressure, heart and lung
- Edema of the lower limbs should be observed.
- Height and weight of the patient should be noticed.



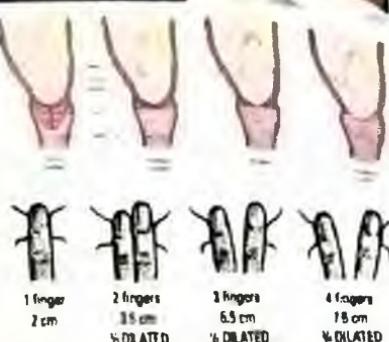
Abdominal examination:

- To check the fundal level
- Identify the position and presentation of the fetus
- Auscultate the fetal heart sounds



Local examination is done to:

- Diagnose of labor.
- Determine of the lie, attitude, presentation and position of the fetus.
- Assess the pelvic & the capacity and the cephalo-pelvic relationship.
- Assess the station of the presenting part.
- Assess the dilatation and effacement of the cervix.
- Assess the condition of the membrane (ruptured or intact).
- Exclude presentation and prolapse of the cord.



- Exclude any abnormality in the birth canal or pelvis, e.g. pelvic deformity, vaginal cyst.

Laboratory tests:

- Blood for Hb%, blood grouping and Rh typing
- Urine for proteins and sugar

Management of the first stage:

Place of delivery:

Hospital delivery is much safer than home delivery and must be insisted upon in the following conditions:

- All primigravidae
- Multipara with a history of difficult labor
- Presence of any obstetric abnormality such as polyhydramnios, twins, toxæmia of pregnancy, contracted pelvis or antepartum hemorrhage
- Presence of any associated disease such as heart disease, diabetes or lung disease.

Complete asepsis:

- With the onset of labor, the patient is instructed to:
 - Remove the hair from external genitalia
 - Take a warm bath
 - Put on a light gown with no underwear
- During labor, ensure strict asepsis, for the patient, attendants and instruments.
- The vulva is cleaned using an antiseptic solution.

Position and mobility:

- Early recumbence is not recommended in the first stage as it leads to inertia and increases the anxiety of the patient.
- But, if she wants to rest lying down, a lateral position will be best as this avoids compression of the inferior vena cava and consequent hypotension.
- Towards the end of the first stage, the patient must lie down in bed.

PV examination (under aseptic precautions):

- Should be minimized, required at least 3 times:
 - Diagnosis of onset of labor
 - With rupture of membranes to exclude cord prolapse or meconium staining of the amniotic fluid
 - Diagnosis of onset of 2nd stage

Bladder and rectum evacuation:

- Keep the bladder empty to prevent reflex uterine inertia
 - The patient voids every 2-3 hours (better) or
 - A catheter is inserted under aseptic precautions.
- Enema is not routinely performed.

Rest:

- **Intact membranes:** The patient is allowed to walk during the intervals between contractions (pains).
- **Ruptured membranes:** The patient should rest in bed, preferably on her left side to improve placental perfusion.
- **Patient should not bear down during contractions (pains) as this:**
 - Is useless.
 - Exhausts the patient.
 - Predisposes to genital prolapse

Nutrition:

- The gastric emptying time is prolonged during labor.
- Aspiration of the vomitus may occur during anesthesia (Mendelson's syndrome)

SO:

- Early in labor (latent phase): Sugar fluids may be given.
- Advanced labor (active phase): Nothing by mouth. IV glucose or glucose-saline is given.

Analgesia:

- By giving proper sedation e.g. meperidine hydrochloride = pethidine.
 - To relieve pain and anxiety.
 - However, it may cause respiratory depression in the newborn.
- So, it should be stopped 2 hours before the anticipated delivery.

NB: Inhalation analgesia (trilene mask) may be given for sedation.

Partogram

Definition:

A graphic presentation of the labor progress where maternal and fetal observations are recorded at regular intervals on a graphic form

Components of the partogram:

- Admission and assessment findings:
 - Date and time
 - Name, Age, blood group, weight
 - Gravidity, parity, EDD, gestational age
 - Relevant obstetric and medical history
- Maternal assessment:
 - Vital signs: pulse, temperature and blood pressure
- Fetal assessment:
 - Record of FHR every 30 minutes, immediately after uterine contraction.
- Labor assessment:
 - Uterine contractions; frequency in 10 minutes strength.
 - Dilatation of the cervix in centimeters against the time in hours (cervicogram)

- Descent of the head in fifths (abdominally) or by zero notation (vaginally)
- State of the membranes (intact or ruptured), and if they are ruptured (spontaneously or artificially), the amniotic fluid color-Clear (C), Meconium-stained (M), or Blood-stained (B)
- Intrapartum medications:
 - Oxytocin administration
 - Epidural anesthesia
 - Other medications
- Fluid balance:
 - Input (oral / IV fluids)
 - Output (urine/ blood loss)
 - Urinary (proteins/ acetone)
- Vaginal examination during labour
It gives information about:
 - Cervix
 - Effacement / Length estimated in cm.
 - Dilatation measured in cm.
 - Position; posterior, anterior or midline
 - Consistency; either or soft
 - Fetus
 - Presentation & Position.
 - Station -3, -2, -1, 0, +1, +2
 - Caput: No caput, small +, large caput +++
 - Moulding
 - Membranes & Liquor
 - I for intact membrane
 - C for amniotic fluid clear
 - M for meconium stained

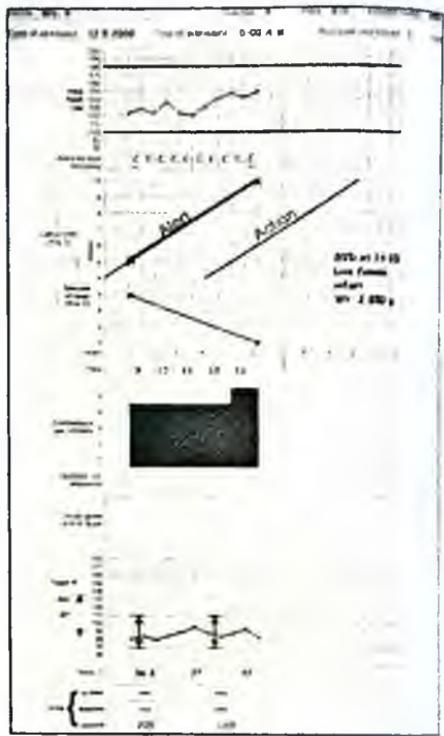
Interpretation of the partogram:

▪ Alert line

A line drawn from point of cervical dilatation denoted at the 1st vaginal examination in active labor.

It separates women into two groups:

- Women with cervical dilatation more than or equal 1 cm / hour who are unlikely to require operative intervention



- **Action line**

Line parallel and 4 hours to the right of the alert line.

If the cervical dilatation is crossing the action line:

- Evaluate the women's progress in labor
- Provoke appropriate intervention

Management of the second stage of labor:

Diagnosis of the second stage:

- The transition from the first to the second stage is not always clinically apparent.
- Presumptive symptoms and signs:
 - The patient feels a desire to evacuate the bladder and the rectum.
 - The uterine contraction become more intense, more frequent and of longer duration.
 - The patient starts to bear down involuntary during uterine contraction by reflex desire.
 - Rupture of the fore waters. But membranes may rupture at any time during labor.
 - Dilatation and gaping of the anus. But deep engagement of the presenting part and premature maternal effort may produce this sign during the latter part of 1st stage.
 - Appearance of presenting part. But excessive moulding may result in the formation of a large caput succedaneum which can protrude through cervix prior to full dilatation.
- The only confirmatory evidence is a fully dilated cervix where no cervical rim can be felt on vaginal examination.

Position:

- Once the onset of the second stage has been confirmed, the patient must be transferred immediately to the delivery room.
- The patient is put in the lithotomy position with her legs supported by leg supports.

Prevention of infection:

- The vulva and the perineum are washed and painted with antiseptic solutions.
- Sterile leggings and towels are applied.
- Bladder and rectum are kept empty.

Observation of progress:

Observation of both the mother and the fetus is carried out along the same lines as those mentioned before in the first stage. At this time, closer and more frequent observations are needed for:

- o The condition of the mother
- o The condition of the fetus
- o The degree of descent of the fetal head in the pelvis
- o The extent of moulding
- o The development of caput succedaneum

Conduct of labor

A. Delivery of the head

- The main task is to prevent perineal laceration by proper perineal support
- Pressing on the perineum with a warm, wet, sterile towel during the uterine contraction till the head is already crowned.
- Patient is asked to bear down during uterine contraction and relax in-between.
- Once head of fetus is crowned, bearing down efforts must be stopped completely.
- To minimize the incidence of perineal lacerations, it is important to maintain flexion of the head and to prevent its extension till crowning occurs.
- Crowning: It is the passage of the biparietal diameter through the vulval ring. The head does not recede in the interval between contractions.



Crowning



Ritgen Manoeuvre

- After crowning allow gradual slow extension of the head by:
- Allow the head to extend only in between uterine contractions.
- The gradual extension may be aided by doing upwards pressure on the perineum by one hand and downwards pressure on the occiput by the fingers of the other hand so as to control the movement of extension (Ritgen maneuver).
- Prevent straining of the patient (trilene inhalation may be given) rapid extension will result in perineal tears.

Episiotomy must be performed if a perineal tear is eminent.

See "episiotomy" in operative obstetrics.

If we maintain flexion of the head by support of the perineum till crowning occurs, and allow gradual slow extension after crowning, the vulva will be distended with suboccipitofrontal diameter = 10 cm.

If extension is allowed before crowning, the vulva will be distended with occiput frontal diameter = 11.5 cm with increased incidence of perineal tears.

B. Delivery of the shoulders and body:

- The head is grasped between the 2 hands and gentle traction is applied downwards and backwards until the anterior shoulder appears below the symphysis pubis, then upwards to deliver the posterior shoulder and again downwards to deliver the anterior shoulder.
- Rest of the body is slowly extracted by gentle traction on shoulders and it usually slips easily.

C. Care of the baby:

- Once head is delivered, do the following.
 - Clearance of the air passages (aspiration)
 - Gentle swabbing of the nose and mouth
- Then inspect the neck
 - If a loop of cord is coiled around the neck, try to slip it gently
 - If several loops or tight coiling are present, 2 clamps are applied and cord is cut inbetween.
- Dealing with the cord after delivery of the fetus
 - Milking of the cord or holding the fetus below the level of the introitus:
 - Some obstetricians prefer adding 10 cc of blood in the cord and placenta to the fetal circulation by milking the cord or holding the infant below the level of introitus
 - These manoeuvres are contraindicated when the fetus is already liable to develop hyperbilirubinaemia as premature fetus, maternal diabetes mellitus and IUGR
 - Cutting of the cord is done between 2 clamps
 - To avoid bleeding from a possible uni-ovular twin
 - To avoid soiling with blood.
- Handling of the fetus:
 - After delivery, the fetus is held from its ankles with the head down.
 - This is not done if there is
 - Asphyxia
 - Premature fetus

- o Suspicion of intracranial hemorrhage.
 - In these conditions, the head down position may precipitate or aggravate intracranial hemorrhage.



Cord clamping

Management of the 3rd stage of labor (delivery of the placenta and membranes):

Aims:

- Complete delivery of the afterbirth-the placenta and membranes
- Prevention of acute inversion of the uterus
- Prevention of the postpartum hemorrhage

One of the two methods may be used in the management of the 3rd stage of labor:

- 1) Conservative management
- 2) Active method

Conservative management (passive physiological management):

This allows physiological changes to take their natural course with minimal intervention.

1) Exclusion of bleeding and uterine atony:

- Evacuation of the bladder by a catheter.
- Put the ulnar border of the left hand just above the fundus to detect any bleeding inside the uterus due to uterine inertia manifested by rise of the level of atonic fundus above the umbilicus.
- Do not massage the uterus as it may initiate irregular uterine contraction with incomplete separation of the placenta and postpartum hemorrhage.

2) Wait signs of separation of the placenta:

- The uterus becomes smaller, harder, globular and easily movable
- A suprapubic bulge due to presence of the placenta in the lower uterine segment
- Slight rise of the level of the contracted fundus as the upper segment over-rides the lower segment which is now distended by the placenta
- Gush of blood from the vagina
- Elongation of the cord
- Failure of cord to recede when uterus is elevated by doctor's hand per abdomen

3) Uterine massage:

To allow contraction of the uterus and control any bleeding.

4) Placental expulsion:

- Done by asking patient to bear down or by fundal pressure. Fundal pressure is avoided if the uterus is lax, to avoid inversion of uterus.
 - Once the placenta is delivered, it is grasped between 2 hands and is rolled so as to make a rope of membrane in order not to miss a part of membranes.
 - Inspect the placenta and membrane to be sure that it is complete and not missing any fragment inside the uterus.

Disadvantages:

- Takes longer time.
- Risk of postpartum hemorrhage is 5%.

Active method "modern management":

(1) Uterine stimulants:

With delivery of the anterior shoulder, ergometrine 0.25-0.5 mg IV is given, to produce strong uterine contractions and thus rapid placental separation.

(2) Placental delivery (Brandt Andrew's method or controlled cord traction):

When the uterus is contracted, the left hand is applied on the suprapubic region to push the uterus upwards and the right hand applies simultaneous gentle traction on the cord downwards and backwards.

- Once the placenta is delivered, it is rolled by both hands like a rope to avoid missing part of the membranes.
- The placenta is inspected to avoid missing parts.



Controlled cord traction

Disadvantages of the active method:

- Rupture of the cord
- Acute inversion of the uterus if done on a lax uterus
- Thus, cord traction is avoided if the uterus is lax, to avoid inversion of the uterus.

Advantages of the active method:

- Less duration and less blood loss
- Significant reduction in postpartum hemorrhage

After placental delivery:

- Repair of perineal tears, if more than 1 cm or if bleeding.
- The vulva is washed with an antiseptic and covered by a sterile dressing.

Blood loss in the 3rd stage of labor:

- 200-300 ml from the placental site
- 100-200 ml from the episiotomy or perineal lacerations.
- During cesarean section, blood loss from the placental site is up to 900 ml.

Management of the 4th stage of labor:

- It is the 2 hours after delivery in which postpartum hemorrhage is liable.
- Careful observation to detect postpartum hemorrhage.
- Uterine massage is done every 15 minutes.

Care of the newly born baby:

Immediately after birth, the infant is handed to a nurse for the necessary management, which is carried out along the following lines:

(1) Clearance of the respiratory passages:

This is very important to guard against the development of lung collapse and neonatal pneumonia.

- Head is always held at a lower level to help drainage of the respiratory passages.
 - A mucus catheter or a soft rubber catheter is used to remove the mucus from the upper air passages.
 - The time of breathing and crying should be noted. If these are prolonged beyond the usual limits, other measures should be done and manage as in asphyxia neonatorum.
- Most normal infants take a breath within few seconds and cry within $\frac{1}{2}$ minute.

(2) Bathing and weighing the infants:

- Immediately after labor, a tepid bath is indicated particularly if the baby is soiled with blood.
- If there are excessive amounts of vernix caseosa, they are removed by using a non-irritant soap or by wiping it will cotton soaked in warm oil.
- The infant is next weighed accurately and its birth weight is recorded, and put an identification mark.

(3) Care of the umbilical cord:

- Double ligation of cord is done with 2 thick silk ligature or plastic umbilical cord clamp.
- The first knot is applied 5 cm from the umbilicus, to guard against strangulation of any congenital hernial protrusion. The second knot is applied 1 inch further for security.
- The cord is then cut distal to the second knot and the stump is painted with alcohol, dried, covered with sulphonamide powder of Dermatol and a sterile bandage is applied.
- Cutting of the cord should be done under strict aseptic precautions, to avoid neonatal tetanus infection or infection by E. coli, Staph. aureus and Streptococci.
- Care of the umbilical stump is done by repeated washing by alcohol and must be dusted by antibiotic powder or spray.

Separation of the umbilical stump usually takes place within the first two weeks after birth, most frequently around the 10th day.

(4) Care of the eyes:

Put penicillin eye drops to ovoid ophthalmia neonatorum.

(5) Congenital anomalies and birth injuries:

Before dressing, the infant must be examined for:

- Any congenital anomaly such as hare-lip, cleft palate, umbilical hernia, imperforate anus, hypospadius, congenital heart disease or spina bifida.
- Birth injuries such as cephalhematoma, Bell's palsy or bone fractures.

(6) Special care of the baby:

▪ Temperature:

The temperature of the infant drops rapidly immediately after birth. Chilling occurs if the infant is left naked. So, the infant must be cared for in a warm crib in which temperature control is regulated closely.

▪ Vitamin K:

Routine administration of vitamin K is needed as prophylaxis against hemorrhagic disease of newborn (intramuscular injection of 1 mg vitamin K).

▪ Physiological jaundice:

It may occur between the second and fifth day of life and disappears spontaneously by the end of first week.

- Stool and urine analysis for the first 2 or 3 days: After birth, the content of the colon is the so-called meconium, which is composed of desquamated epithelial cells from the intestinal tract, mucus and epidermal cells and lanugo (fetal hair) that have been swallowed with the amniotic fluid.
- Meconium has brownish green color due to the presence of bile pigments. After the third day or fourth day, as the consequence of ingesting milk, the meconium disappears and is replaced by light yellow homogenous feces with a characteristic odor.
- The passage of meconium and voiding (urination) takes place within minutes or within the first 24 hours.
- Failure of the infant to pass meconium or urine after the first 24 hours-36 hours suggests a congenital defect such as imperforate anus or a urethral valve.

Effects of labor on the mother and the fetus

Effect of labor on mother:

- 1st stage: little effect on vital signs.
- 2nd stage:
 - Pulse: increased up to 100 beats per minute.
 - Temperature: increased up to 37.5°C.
 - Systolic BP: rises slightly.
 - Conjunctiva: showing congestion.
- 3rd stage:
 - Blood loss from placental site: about 200-300 cc.
 - Blood loss from episiotomy: about 100-200 cc.

Effect of labor on fetus:

1) Moulding

Definition:

- It is alteration in shape of the fetal head due to the compression to which it is subjected during labor. Compression results in variable degree of overlap of the vault bone.
- The bones of the face and the base of the skull can not be moulded as they are well ossified and so protect the vital centers in the medulla and base of brain from any serious compression.
- Moulding is a protective mechanism and prevents the fetal brain from being compressed as long as it is not excessive, too rapid or in an unfavorable direction.

Degrees:

- Slight moulding

Is physiological and beneficial as it helps easy passage of the fetal head through the birth canal.

- Excessive moulding (in cases of disproportion)

Is dangerous as it may result in intracranial hemorrhage.

- The skull of the preterm infant, being softer and having wider sutures, may mould excessively
- The skull of the postmature infant does not mould well and its greater hardness tends to make labor more difficult.

2) Caput succedaneum

Definition:

Edema of the subcutaneous tissue of the fetal scalp due to compression of the fetal head which interferes with venous return

NB: Caput disappears within one or 2 days after delivery.

Caput is a vital process, it does not occur with IUFD.

Types:



Normal caput is central



Not normal



I. Cervical caput:

- Small.
- The head is compressed against the edge of the cervix in some cases of rupture membrane before full cervical dilatation (prolonged labor).
- Non-significant.

II. Pelvic caput:

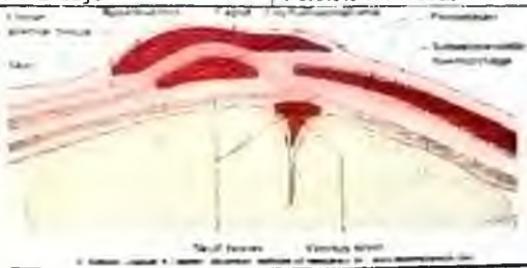
- Large.
- The head is compressed against the pelvic bones in cases of obstructed labor.
- Significance:
 - Indicates mechanical obstruction.
 - Obscures sutures and fontanelles thus interfering with identification of position in vertex presentation.
 - Gives a false impression that the head is engaged while actually it is not.

III. Artificial caput (Chignon):

- Induced by the ventouse.
- Technique:
 - i. The cup is applied on the occiput and negative pressure is applied to create the caput a part of scalp becomes trapped in the cup
 - ii. Traction on the cup by a chain promotes flexion of the head thus helping rotation and descent.

Differential diagnosis: from cephalhematoma.

Caput succedaneum	Cephalhematoma
Edematous swelling on the fetal skull, a serosanguinous (serum and blood) infiltration into the scalp tissue. Due to pressure by a girdle of contact which is usually the cervix and the venous return is retarded and the area line over the os becomes congested and edematous.	A swelling on the infant's skull, an effusion of blood under the periosteum covering it. due to friction between the skull and the pelvis. It occurs in cases of cephalo pelvic disproportion and precipitate labor when tearing of the periosteum from the bone causes bleeding.
Present at birth	Appears after 12 hours
Soft, pit on pressure	Soft, does not pit
Diffuse, ill-defined edge	Circumscribed, well-defined edge
Overlies more than one bone and lies on sutures	Overlies individual bone and limited by sutures at the border of the individual bone
Skin over is ecchymotic	Skin over is normal
Disappears within 1-2 days	Persists for weeks



Cephalhematoma

The fetal heart sounds:

- During uterine contractions of labor, fetal heart sounds become slower in rate. Shortly following the cessation of the contraction, they rapidly regain their original rate.
- When there is impending fetal distress, the time taken by the fetal heart sounds to return to normal becomes longer.
- In actual fetal distress, the heart rate becomes more rapid or much slower than the average normal and in cases of severe distress the rhythm as well becomes irregular.

Active management of labor

- The aim of active management of labor is to ensure that the primigravida will deliver a healthy baby in less than 12 hours.
- This requires a trained experienced medical and nursing staff throughout the whole process of labor.

Benefits of active management of labor:

- Good psychological effect on the patient due to increased attention.
- It avoids prolonged labor which can lead to :
 - Maternal distress and emotional upset.
 - Fetal hypoxia and distress.
 - Exhaustion of the medical and nursing staff.
- Easy control of pain.
- Decrease perinatal mortality.

Principles of active management of labor:

A- Patient preparation:

- **Antenatal education:**

The mother is informed about the physiology of labor and assured that labor will take less than 12 hours, thus she can cope better with the stress of labor.

- **Personal support:**

There should be one nurse for each mother throughout labor. The presence of the husband is favored to support her wife.

- **Nutrition:**

Nothing is allowed by mouth except water. To prevent dehydration and ketoacidosis, when labor is delayed more than 8 hours, saline-glucose solution can be given by IV at a rate of 60-120 ml/hour.

- **Position:**

The mother is allowed to walk about (ambulation shortens the duration of labor and decrease the need for analgesia and the incidence of fetal heart rate abnormalities).

- **Analgesia:**

Provision of suitable analgesia

B- Problem detection (early diagnosis of abnormal progress):

Poor progress in labor may be due to faults in the power, the passage, or the passenger.

- The most useful pointer to the abnormal progress is that the rate of cervical dilatation is not following a normal pattern (see partogram).
- Vaginal examination is done when mother is admitted to the hospital and repeated every 1-2 h to determine the rate of cervical dilatation (recorded on the partogram).
- Failure of the cervix to dilate by at least 1 cm./hour in the active phase of labor indicates inefficient uterine action.
- The evidence of progress in the second stage of labor is the rate of decent of the presenting part through the birth canal.

C-Problem control-correction of abnormal progress:

- Exclusion of the cephalo-pelvic disproportion.
- Exclusion of the fetal distress (acceleration).
- Augmentation of labor:

If a poor uterine action is suspected, the cervix is not dilating properly, steps should be taken to improve it:

I- Amniotomy:

- Ideally, only when the cervix is fully effaced at least 3 cm dilated.
- Rupture of membranes:
 - Improve the uterine contraction pattern
 - Allows direct examination of amniotic fluid for meconium staining
 - Allow application of the fetal scalp electrode
- Adequate clear liquor is a reassuring sign that the fetus is in good condition to withstand stress of labor.
- Scanty or meconium stained liquor indicates CTG.

II- Oxytocin infusion:

If labor is not accelerated within two hours after amniotomy, oxytocin infusion is started.

D- Shortening of the 2nd stage by forceps or ventouse in some patients.

E- Active management of 3rd stage of labor

F- Active management of 4th stage of labor.

Analgesia and anesthesia in labor and delivery

LEARNING OBJECTIVES:

- To describe the different types of analgesia and anesthesia used in labor
- To describe the ideal analgesic for normal labor
- To describe the required maternal and fetal monitoring during labor

Although labor is a physiological process, it is a painful one.

Causes of pain during labor:

- Stretch of the cervix during dilatation
- Distention and ischemia of the muscle wall of the uterus with build-up of lactate
- Stretch of the vagina and perineum in the second stage

The ideal analgesic during labor should be:

- Harmless to both mother and fetus.
- Abolish or diminish pain over a long interval in the first stage and the whole duration of the 2nd stage, and should produce the maximal effect during the birth of the head
- Not interfere with the normal uterine action or prolong the course of labor
- Safe and easily to administer
- Cheap, available and easily transport
- Not interfere with the conduct of labor and management of the patient.

Analgesic drugs:

The most commonly used analgesic drugs during the first and second stages of labor are the following:

(A) Non-inhalation: Pethidine, morphine, barbiturates, sparine, and valium.

(B) Inhalation: Nitrous oxide and oxygen, trilene and air and pantherane and air.

(C) Regional analgesics (epidural block): Lumbar epidural block and caudal epidural block.

Anesthesia:

I- General anesthesia:

General anesthesia can cross the placenta and this should not be induced until actual delivery is imminent to minimize transfer of anesthetics to the fetus.

(a) Inhalation anesthesia (gas anesthetics):

- Nitrous oxide gas and oxygen:
- Trichloroethylene (trilene):
 - Trilene is a light anesthetic for administration in the terminal stage of normal delivery and also for outlet forceps extraction.
 - It is used as a mixture of 80% trilene and 20% oxygen.

(b) Intravenous anesthesia:

e.g. thiopental (Intravital) and ketamine (Katalar).

II-Regional anesthesia:

These drugs are used in various ways to block the condition of pain impulses along the sensory nerves, which ends in the genital tract.

(a) Local infiltration anesthesia:

This method is used for spontaneous delivery, outlet forceps or breech deliveries.

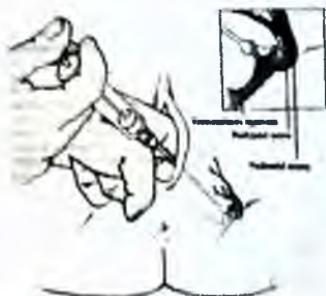
Advantages:

- No anesthetic mortality.
- No risk of fetal asphyxia.
- The uterine contractions are not impaired.

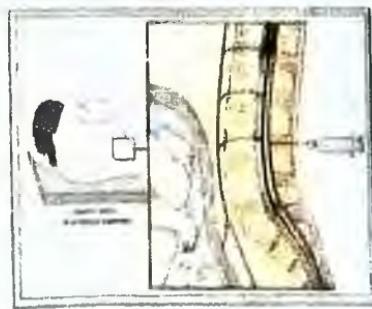
For repair of episiotomy, perineal tears, novocain 2% solution is injected through the edges.

(b) Pudendal nerve block:

- This is a method of local anesthesia in which the pudendal nerve is blocked where it crosses the ischial spine.
- The pudendal nerves are sensory nerves serving the lower vagina, the perineum and vulva.
- It can be used for spontaneous delivery or low forceps.
- Procaine solution 1% is injected with a long needle which is introduced close to the sacral tuberosity guided with one finger in the vagina or rectum until the ischial spine is reached.



Pudendal nerve block



Spinal anesthesia

(d) Paracervical block:

- Infiltration around the paracervical ganglia and fibers.
- It needs special needle with a guarded tip.

(e) Spinal anesthesia:

- A special needle is introduced to subarachnoid space.
- Suitable for vaginal delivery and cesarean section.

(I) Caudal anesthesia:

The anesthetic drug is injected through the sacral hiatus into the extra-dural space (rarely done).

Anesthesia for cesarean section:

I- General anesthesia:

Uses:

General anesthesia may be used for:

1. Repair of episiotomy.
2. Instrumental (forceps) delivery.
3. Manual removal of the placenta.

Drugs used:

(I) Gas drugs = Nitrous oxide and oxygen:

Safe for both mother and fetus and does not affect uterine contractions.

(II) Volatile liquids = Halothane (Fluothane):

Causes uterine relaxation, so may lead to postpartum hemorrhage.

(III) Intravenous anesthetics:

- Thiopentone.
- Ketamine (Ketalar).

B. Epidural analgesia:

When properly employed is safe for both mother and fetus, but has a slow onset of action.

C. Subarachnoid (spinal) anesthesia:

- The local anaesthetic is injected into the subarachnoid space.
- Has a rapid onset of action, but may cause hypotension and headache.

Analgesia for the 1st stage:

1. Pethidine + Sparine.
2. Epidural.
3. NO₂ + O₂.

Analgesia for the 2nd stage:

1. Epidural (continued from the 1st stage).
2. NO₂ + O₂.

Anesthesia for episiotomy and tears:

1. Local perineal infiltration.
2. Pudendal nerve block.
3. Epidural (continued from the 1st stage).
4. Rarely IV anaesthetics or NO₂ and O₂.

Anesthesia for forceps:

1. Epidural continued from the 1st stage.
2. General anesthesia.
3. Spinal anesthesia.

Malpresentation and malposition

LEARNING OBJECTIVES:

- To define malpresentation and malposition.
- To list the etiology of the common malpresentations and malpositions
- To describe the lines of obstetric managements of these problems.

Definition:

Malpresentation is any presentation except vertex (e.g. face, brow, breech, shoulder or complex). Left and right occipito-anterior are the only normal presentation and position. Occipito-Posterior (OP) is malposition.

Causes:

A. Faults in power:

- Pendulous abdomen (laxity of abdominal and uterine muscles). Commonest cause in multipara.
- Dextro-rotation of the uterus (right side) favors occipito-posterior when the back is to the right side.

B. Faults in passages:

- Contracted pelvis.
- Abnormalities in the shape of the pelvis.
 - Android and anthropoid pelvis favors → OP.
 - Flat pelvis favors → face presentation.
- Pelvic tumors (multiple fibroid and ovarian tumors).
- Uterine anomalies as bicornuate or septate uterus.
- Abnormal insertion of the placenta as:
 - Placenta previa → non-engagement
 - Fundal insertion of the placenta → transverse lie

C. Faults in passenger:

- Intrauterine fetal death.
- Prematurity.
- Congenital anomalies as:
 - Anencephaly → face presentation
 - Hydrocephalus → breech presentation
- Multifetal pregnancy: Twins or triplets.
- Large sized fetus.
- Hydramnios, poly and oligo-hydramnios.
- Short umbilical cord → transverse lie.
- Coil of cord around the neck → face presentation.

The main etiological factors for common malpresentation:

Breech:

- Prematurity
- Hydrocephalus
- Placenta previa

Transverse lie (shoulder presentation):

- Multiparity
- Uterine anomalies
- Abnormal insertion of the placenta

Face and brow:

- Anencephaly or dolicocephaly.
- Tumors of fetal neck.
- Coils of the cord around the neck.

Occipitoposterior:

- Abnormalities in the shapes of the pelvis as android and anthropoid
- Anterior insertion of the placenta
- Maternal kyphosis

Diagnosis of malpresentation and malposition:

- History:
 - of increased fetal movement or
 - of a lump in the epigastrium
- Abdominal examination:
 - Pendulous abdomen
 - FHS above the level of the umbilicus
 - Non-engagement of the head in primigravida
 - Delay descent of the presenting part during labor
- Vaginal examination:
 - Feeling any thing other than the vertex.
 - Premature rupture of membrane (PROM) or the membranes are bulging through undilated cervix or
 - High presenting part
- Ultrasonography for:
 - Diagnosis of malpresentation

Complications of malpresentation and malpositions:

- Premature Rupture of Membranes (PROM) leading to:
 - prolapse of the cord,
 - dry labor, and intra amniotic infection.
- Presentation and prolapse of the cord
- Primary uterine inertia due to absence of fitting of the presenting part in lower uterine segment.

Prolonged labor due to:

- o Obstructed labor leading to rupture uterus.
- o Uterine inertia leading maternal exhaustion.

Postpartum hemorrhage due to:

- o Anesthesia.
- o Prolonged labor.
- o Maternal exhaustion and inertia.

Perineal lacerations, traumatic lesions of the genital tract

Puerperal sepsis

Perinatal mortality is high due to:

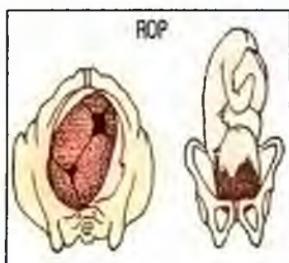
- o Asphyxia due to:
 - Cord prolapse
 - Intracranial hemorrhage
 - Prematurity
 - Placental compression or separation.
- o Intracranial hemorrhage
- o Fetal injuries

Occipito-posterior position

LEARNING OBJECTIVES:

- To define occipito-posterior position.
- To list causes of occipito-posterior.
- To list causes of failure of spontaneous anterior rotation.
- State the complications which may be associated with occipito-posterior.
- Describe how to diagnose occipito-posterior.

- 20-25% at the onset of labor.
- ROP is more common than LOP due to:
 - The right oblique is slightly longer than the left oblique.
 - The pelvic colon encroaches on the left oblique.
 - Dextrorotation of the uterus favors ROP.



Etiology:

A. Faults in passages:

- Android and anthropoid pelvis are the commonest causes of OP. They have a narrow fore pelvis and wide hind-pelvis. So, the occipital region of the fetal skull is filled in the posterior part of the pelvis and the smaller biparietal diameter accommodates into the narrow fore pelvis.
- Anterior insertion of the placenta favors occipito-posterior because the fetus always faces the placenta.
- Minor degree of maternal kyphosis: The convexity fetal back fits into the concavity of lumbar kyphosis.

B. Faults in the passenger:

Dead fetus, twins, oligohydramnios, placenta previa and pelvic tumors.

C. Faults in power:

Pendulous abdomen.

D. Idiopathic:

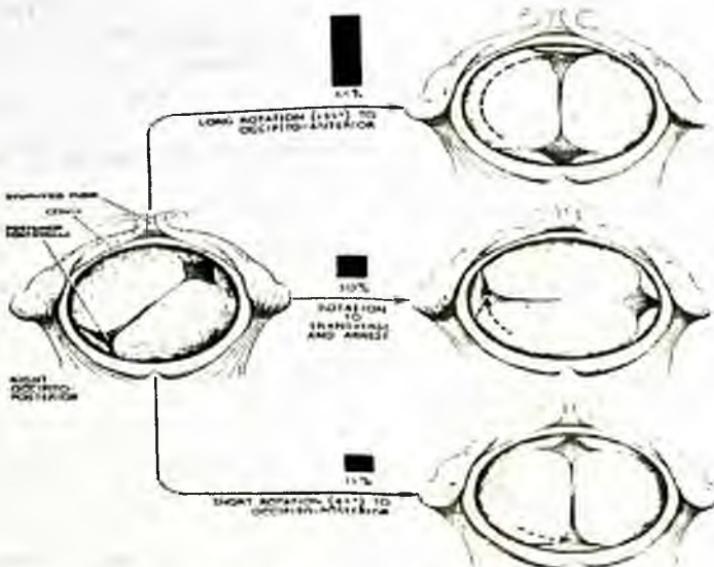
in about 10-20% of cases, there is no definite cause.

Mechanism of labor:

- Deflexion (partial extension of the head) is present in all cases of OP with varying degrees and it is due to:
 - Wide biparietal diameter (9.5 cm) enters the pelvis in the narrow sacrooccyloid diameter (9.5 cm) delaying the descent of the occiput, while the smaller temporal (8 cm) enters in the wide oblique diameter (12 cm) favoring its descent leading to deflexion of the head.
 - Apposition of 2 convexities of fetal and maternal spine.
- As a result of deflexion, the engaging diameter is occipito frontal diameter (11.5 cm) and this caused delayed engagement.

The degree of deflexion influence the mechanism of labor:

- A. Normal mechanism (90°): (long anterior rotation):
 - Deflexion is corrected and complete flexion occurs.
 - The occiput reaches the pelvic floor first with long anterior rotation $\frac{3}{8}$ circle to bring the occiput anterior and the fetus is delivered normally as OA.
 - During rotation of the head, the shoulder rotate 90° only.
- B. Abnormal mechanism (10°): (persistent OP):
 - It depends on the degree of deflexion.
- 1- Mild deflexion (1°):
 - The occiput rotates anteriorly $\frac{1}{8}$ of a circle and the head is arrested in the transverse diameter → deep transverse arrest.
 - No further progress of labor, labor is obstructed
- 2- Moderate deflexion (3°):
 - The occiput and sinciput meet the pelvic floor at the same time, no rotation of the occiput occurs and the head persists in the oblique diameter → persistent oblique OP.
 - No further progress of labor, labor is obstructed
- 3- Major deflexion (6°):
 - The sinciput reaches the pelvic floor first. So it rotates anteriorly $\frac{1}{8}$ of a circle and so the occiput rotates posteriorly $\frac{1}{8}$ or a circle → direct OP or face to pubis.
 - The head may be delivered vaginally by flexion. However, this mode of delivery is associated with marked liability to perineal tears due to:
 - The vulva is distended by occipito-frontal diameter (11.5 cm).
 - The perineum is over stretched by the bulky occipital region of the head.



Possible methods of rotation of the head

Factors that favor long anterior rotation 3/8 (favorable prognostic signs):

A. Powers:

- Good uterine contraction.
- B. Passages:**
- No premature rupture of membrane.
- Normal roomy pelvis.
- Good pelvic floor.
- No soft tissue obstruction e.g. fibroid, ovarian cyst.

C. Passengers:

- Well flexed head
- Normal sized head
- Early engagement of the head

Causes of failure of long anterior rotation (persistent OP):

A) Powers:

- Uterine inertia (weak uterine contractions).

B) Passages:

- PROM and drainage of liquor amnii → difficult rotation
- Contracted pelvis that mechanically interferes with rotation (outlet contraction)
- Too lax or too rigid pelvic floor
- Soft tissue resistance e.g. pelvic tumors, placenta previa

C) Passengers:

- Persistent deflexion of the head
- Large sized head
- Non-engagement of the head

Diagnosis of occipito-posterior:

During pregnancy:

I. Inspection:

- Flattening of the abdominal contour
- A groove may be seen below the umbilicus corresponding to the neck of the fetus
- Difficulty in defining the fetal back
- Marked fetal movement anteriorly

II. Palpation:

Fundal level:

Corresponds to the period of amenorrhoea

Fundal grip

The breech is felt in the fundus as a soft, bulky, irregular, non-ballotable swelling

Umbilical grip

- The back of the fetus is felt away from the middle line
- Sub-umbilical groove corresponds to the fetal neck
- Fetal limbs are felt on both sides of the midline

First pelvic grip

- Non-engagement of the head due to deflexion
- Head is felt towards the pelvis as a smooth, hard, regular and ballotable swelling
- Head is felt smaller and tends to recede from the pulsating fingers because we hold bitemporal and not the biparietal diameter of the fetal head.

Second pelvic grip

To detect the degree of deflexion of the head

III. Auscultation:

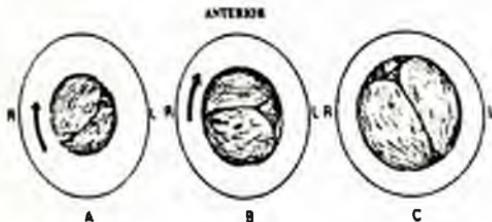
- FHHS are heard in the flank away from the middle line
- However, in cases of direct OP, they can be heard just below the umbilicus in the middle line.

IV. Ultrasonography or radiography (lateral X-ray will confirm the diagnosis)

During labor:

On vaginal examination:

- The anterior fontanelle is more obvious than the posterior because of the deflexed attitude and it will be felt in the anterior segment of the pelvis.
- In neglected cases, there is a large caput succedaneum which obscures the sutures and fontanelles, so, palpation of the posterior ear helps to diagnosis the position of the occiput as the convexity of the flap of the ear is toward the occiput.



Vaginal touch pictures in a right occipitoposterior position

- (A) Anterior fontanelles are felt to left and anteriorly. Sagittal suture in the right oblique diameter of the pelvis.
- (B) Anterior fontanelle felt to left and laterally. Sagittal suture in the transverse diameter of the pelvis.
- (C) Following increased flexion, the posterior fontanelle is felt to the right and anteriorly. Sagittal suture in the left oblique diameter of the pelvis. The position is now right occipito-anterior.

Management during labor:

(A) 1st stage:

- Exclude contracted pelvis or outlet contraction
- Exclude presentation and/or prolapse of the cord
- Overcome the patient's anxiety, relieve pain by sedatives e.g. pethidine
- Avoid premature rupture of membrane by:
 - More rest in bed.
 - No bearing down or straining.
 - Avoid high enema.
 - Avoid repeated vaginal examination.
- Combat inertia by fluid nutrition IV glucose, and bladder and rectum are kept empty
- Aseptic precautions.
- Constant observation for the mother, fetus and progress of labor.
- Rest of management as normal labor.

(B) 2nd stage:

- Wait 2 hours in primigravida and ½-1 hour in multipara provided no fetal or maternal distress present.
- Uterine inertia → pitocin drip to help long anterior rotation.

Mechanism and management of labor in OP:

	Mechanism	Management
Long anterior rotation (90%)	<p>Deflexion is corrected. Occiput reaches the pelvic floor first → long anterior rotation → occiput becomes anterior → head is delivered by extension.</p> <p>At the same time, shoulders rotate 2/8 to occupy the same oblique diameter occupied to the head. After delivery of the head, anterior shoulder rotates 1/8 of a circle, hinges under symphysis pubis and delivery of the shoulder and trunk normally.</p>	<p>Normal labor ↓ Failed normal labor ↓ Forceps or ventouse (if failed) ↓ LSCS</p>
Persistent oblique OP (3%)	Moderate deflection. Occiput and sinciput meet the pelvic floor at the same time → no rotation → persistent oblique OP	A- Cesarean section: safer for the mother and fetus. B- Ventouse: rotation occurs with extraction.
Deep transverse arrest (1%)	Mild deflexion. Occiput rotates anterior 1/8 of a circle → head is arrested in the transverse diameter → deep transverse arrest	C- Old methods : (obsolete) <ul style="list-style-type: none"> • Manual rotation and forceps extraction. • Forceps rotation and forceps extraction : <ul style="list-style-type: none"> - Scanzoni double application. - Kielland forceps
Direct OP = face to pubis (6%)	Major deflexion. Sinciput reaches the pelvic floor first. So, it rotates 1/8 of a circle anterior → so, the occiput rotates posterior 1/8 of a circle → direct OP → head is delivered by flexion	<p>Normal as face to pubis ↓ If failed ↓ Forceps + episiotomy to prevent perineal laceration If failed ↓ LSCS</p>

Indications of CS:

- Deep transverse arrest of the head or persistent oblique occipitoposterior.
- Others: contracted pelvis, large fetus and other obstetric indications (see C.S.).

Maternal risks:

As malpresentation

Face and brow presentations

LEARNING OBJECTIVES:

- To define face and brow presentations
- To list causes of face and brow presentations
- To recognize the types and positions of face and brow presentations
- To describe the complications which may be associated with face and brow presentations
- To state how to diagnosis face and brow presentations

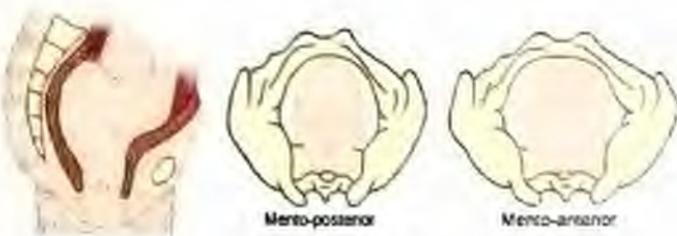
Face presentations

Definition:

It is a cephalic presentation in which the head is completely extended.

The attitude of extension involves both cervical and dorsal spine.

Incidence: 1:500 at full term



Etiology:

- The majority develops during labor from vertex presentations with the occiput posterior; this is termed secondary face presentation.
- Less commonly the face presents before labor; this is termed primary face presentation.
 - I- Primary face presentation: During pregnancy, rare. It may be due to:
 - Congenital abnormality as:
 - Anencephaly (The commonest fetal cause of face presentation).



- o Anencephaly
- o Tumors of the fetal neck (congenital goiter).
- o Doliccephaly (long anterior posterior diameter of the head).
- Spasm of the fetal neck muscles:
- Loops of the cord around the neck.
- Idiopathic

- II- Secondary face presentation: During labor, more common
- Contracted pelvis especially flat pelvis:
 - In the flat pelvis, the head enters the transverse diameter of the brim and the parietal eminences may be held up in the obstetrical conjugate → The head becomes extended and face presentation develops.
 - So, occipito-posterior is more prone to develop face presentation if associated with flat pelvis.

- Pendulous abdomen in grand multipara:
- Other factors that favor malpresentation as:
 - Hydramnios, pelvic tumor, large sized fetus and multiple pregnancy.

Positions:

- The denominator in face presentation is the chin or mentum. There are four positions governed by the direction of the back.

1 st position (RMP)	Back anterior and to the left chin posterior and to the right.
Right-Mento-Posterior	
2 nd position (LMP)	Back anterior and to the right chin posterior and to the left.
Left-Mento-Posterior	
3 rd position (LMA)	Back posterior and to the right chin anterior and to the left.
Left-Mento-Anterior	
4 th position (RMA)	Back posterior and to the left chin anterior and to the right.
Right-Mento-Anterior	

- Mento-anterior are more common than mento-posterior positions because the face presentation is often the result of complete extension of the deflexed head in cases of occipit-posterior.



Positions of face presentation

Mechanism of labor:

(A) Mento-anterior

- 1- **Descent**
- 2- **Engagement by submento bregmatic diameter (9.5 cm)**: The engaging diameter in a face presentation is the submento bregmatic diameter.
- 3- **Increase extension**.
- 4- **Internal rotation of the head** occurs when the chin reaches the pelvic floor and rotates forwards 1/8 of a circle. The chin escapes under the symphysis pubis.
- 5- **Flexion**: The submental region hinges under the symphysis pubis then the face is delivered by flexion followed by brow, vertex and occiput.
- 6- **Restitution**: 1/8 of a circle in the opposite direction of internal rotation.
- 7- **External rotation**: The shoulders enter the pelvis in the opposite oblique diameter and the anterior shoulder reaches the pelvic floor first and rotates forwards 1/8 of a circle in the opposite direction of internal rotation and in the same direction restitution. This movement is transmitted to the head.
- 8- **Delivery of the shoulder and trunk**: Anterior shoulder escapes under the symphysis pubis, the posterior shoulder is delivered 1st by lateral flexion of the spine followed by anterior shoulder and the body is delivered.

(B) Mento-posterior (MP):

Mento-posterior (MP):

Normal mechanism (% of cases)

Long anterior rotation

If the head is completely extended. So, the chin reaches the pelvic floor first → internal rotation of the chin $3/8$ of a circle anteriorly

Delivery as mento-anterior

Abnormal mechanism (% of cases)

No rotation

Sinciput and chin reaches the pelvic floor at the same time → no rotation

Persistent oblique menoposterior

Internal rotation of the chin $1/8$ of a circle anteriorly

Deep transverse arrest

No further mechanism of labor

Obstructed labor

Head is incompletely extended and the sinciput reaches the pelvic floor first and rotates forwards $1/8$ of a circle. So, the chin rotates posteriorly $1/8$ of a circle which bring the chin in the hollow of the sacrum.

Direct MP



(C) Persistent menoposterior position

Direct MP unlike direct OP cannot be delivered as:

- 1- Delivery must occur in extension while the head is already maximally extended.
- 2- By the time, the chin is low down in the pelvis, the shoulders enter the pelvis and become impacted, and then labor is obstructed.

The head is delivered by flexion in:

- 1- Face mento-anterior
- 2- Face to pubis (direct occipito-posterior)
- 3- After coming head of breech delivery

Abdominal palpation of the head in a face presentation.
Position right meatoposterior

Diagnosis:

(A) During pregnancy:

	MA	MP
Abdominal examination:		
1- Inspection	Easy inspection of fetal movements	Subumbilical groove
2- Palpation		
Fundal level	Correspond to the period of amenorrhea	Correspond to the period of amenorrhea
Fundal grip	Breech	Breech
Limbs	Easily felt on both sides	Back is on one side and limbs are on the other side
Back	Difficult to be felt being extended	
Groove	Difficult to be felt	Sub umbilical groove (sulcus) is felt between the occiput and the back
Chin	May be felt on the same side of the limbs as a horse-shoe shaped	Difficult to be felt
1 st pelvic grip	Head	Head
2 nd pelvic grip	Occiput is felt at a higher level than the sinciput as the head is extended	
3- Auscultization	FHS is heard below the umbilicus on the same side of limbs (through fetal chest)	FHS is difficult to be heard because the fetal chest is in contact will the maternal spine
Ultrasonography :		
<ul style="list-style-type: none"> ▪ Confirm the diagnosis ▪ Exclude fetal anomalies as anencephaly and dolicocephaly 		

(B) During labor:

- 1- Findings felt on abdominal examination.
 - 2- Vaginal examination.
- The presenting part is high, soft and irregular.
 - When the cervix is sufficiently dilated, we can recognize the face by the supra-orbital ridges, the ala of nosi, the alveolar margin and the chin.
 - Confusion between the mouth and anus could arise but the mouth will be open and the hard gums diagnostic.
 - As labor progresses, the face become edematous making it more difficult to distinguish from breech with extended legs.

Management of face presentation:

1st stage:

- Routine observations of maternal and fetal conditions are made as in normal labor. Continuous monitoring of the fetal heart
- Immediately following rupture of the membrane a vaginal examination should be performed to exclude cord prolapse as the face is an ill-fitting presenting part.
- Labor is prolonged due to no moulding of the bone of the face and inertia as the presenting part is not well fitting on the cervix.
- Contracted pelvis should be excluded



Birth of head in mento-anterior position

(A) Chin escapes under symphysis pubis.

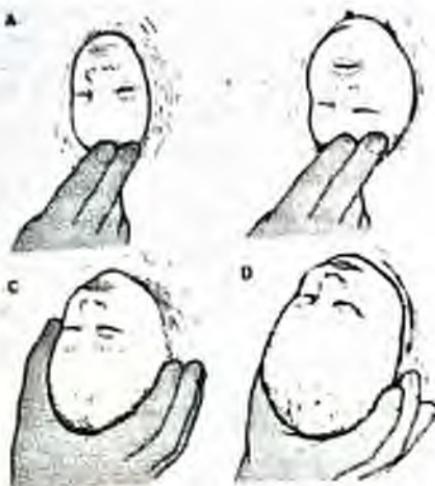
(B) Head is born by flexion.

Delivery of face presentation:

1. Sinciput held back to increase extension until the chin is born
 2. Chin is born
 3. Flexing the head to bring the occiput over the perineum
 4. Flexion completed. The head is born
- No place for ventouse (dangerous)
 - The baby's face is always bruised and swollen at birth with edematous eye lids and lips which is only temporary and it will disappear within few days.

Old method:

1. Conversion into vertex by internal manipulations but it practically difficult and often fails due to extension of the trunk.
2. Manual rotation and forceps extraction as MA.
3. Forceps rotation and extraction (Kieland forceps), but it is risky to mother and fetus.



Delivery of face presentation. (A) Sinciput held back to increase extension until the chin is born. (B) Chin is born. (C) Flexing the head to bring the occiput over the perineum. (D) Flexion completed. The head is born.

Delivery of face presentation

Indication of CS:

- Deep transverse arrest of the face or persistent oblique mentoposterior or direct M.P.
- Others: contracted pelvis, large fetus and other obstetric indications.

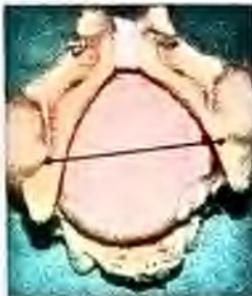
Prognosis:

- Fetal mortality is high 10-15% due to:
 - Congenital anomalies
 - Asphyxia
 - Prolapse of the cord
 - Birth trauma due to operative interference
 - Edema of the glottis
- Maternal risks: As malpresentation.

Brow presentation

Definition:

- It is cephalic presentation in which the head is midway between flexion and extension.
- The engaging diameter is mentovertical (13.5 cm), which exceeds all diameters in an average sized pelvis.



Mentovertical diameter

Incidence: 1/1000 deliveries.

Etiology:

These are the same as for a secondary face presentation.

Types:

Transient brow: During conversion of a vertex into a face presentation.

Persistent brow: Extremely rare.

Positions:

The denominator is the frontal bone.

4 positions:

- 1st right fronto-posterior
- 2nd left fronto-posterior
- 3rd left fronto-anterior
- 4th right fronto-anterior

Mechanism of labor:

Transient brow:

- The fetus is small, pelvis is adequate.
- It is changed into either OP or face and this may be followed by spontaneous delivery.

Persistent brow:

- With a normal sized head and average pelvis, the engaging diameter is the mentovertical (13.5 cm) which is longer than any diameter of the pelvic inlet.

- So, no mechanism of labor → Labor is obstructed.

Diagnosis:

- (A) Abdominal examination is difficult. Occiput and sinciput may be felt at the same level back is straight.
- (B) Vaginal examination: during labor:
 - Slow dilatation of the cervix with protruding membrane and height presenting part, more liability to premature rupture of membrane and cord prolapse.
 - We feel frontal bone, supraorbital ridge and root of the nose.
- (C) Ultrasonography is diagnostic

Management:

Transient brow presentation:

- The majority of cases of brow presentation are transient.
- Accordingly, there is no hurry about interference as it may be changes into face or vertex.
- Contracted pelvis → CS

Persistent brow presentation:

LSCS is the best and safest method to avoid complications:

Old methods (not used nowadays).

- Internal podalic version and breech extraction the cervix is fully dilated there is sufficient amount of liquor, uterus is not tonically retracted, multipara.
- Conversion into face or vertex.
- Craniotomy → dead fetus.

Complication:

As malpresentations

Breech presentation

LEARNING OBJECTIVES:

- To define breech presentation and list its causes.
- To understand how to diagnose breech presentation and describe its different types and positions.
- To state the complications associated with breech presentation.
- To describe the different options of management of breech presentation with emphasis on the manoeuvres used for the delivery of the after coming head.
- To recognize the role of cesarean section in the management of breech presentation

Definition:

It is a longitudinal lie in which the buttocks with or without the lower limbs present.

Incidence:

- Breech presentation has a higher incidence during pregnancy (about 25% before 32 weeks) than during labor 3.5%.
- This variation is explained by the fact that a good number of breech presentation undergoes spontaneous version between 32 weeks and full term.
 - 25% before 32 weeks gestation.
 - 7.5% preterm between 32-37 weeks gestation.
 - 3.5% at full term deliveries.

Etiology:

Any factor that interferes with the spontaneous version or interfere with the accommodation of the fetus to the pyriform shape of the uterus.

A) Fault in power:

Pendulous abdomen.

B) Fault in passenger:

- Prematurity (commonest cause due to relatively excessive liquor).
- Breech with extended legs (legs splint trunk which interferes with spontaneous version).
- Twins.
- Hydrocephalus. Large head accommodate well with wide fundus.
- Oligohydramnios (restricts movement).
- Polyhydramnios which allows free movement.
- Intrauterine fetal death "no movement so no spontaneous movement".



- Small for date fetus (IUGR).
- C) Fault in passages:**
- Contracted pelvis.
- Congenital anomalies of uterus. Bicornuate or separate uterus interferes with version.
- Uterine and pelvic tumors.
- Placenta previa.

Positions:

- The denominator in breech presentation is the back of the sacrum.
- Four positions are commonly described, and these are:
 - 1st position: LSA (Left Sacro-Anterior)
 - 2nd position: RSA (Right Sacro-Anterior)
 - 3rd position: RSP (Right Sacro-Posterior)
 - 4th position: LSP (Left Sacro Posterior)
- Sacro-anterior is more common than sacro posterior as concavity of the front of the fetus in sacro anterior fits into the convexity of the maternal spine.

Types (varieties):

A) Complete breech:

- Common in multipara
- The feet present beside the buttocks as the hip and the knee are flexed (the thighs are flexed on the abdomen and the legs are flexed on the thighs).

B) Breech with extended legs (Frank breech):

- More common in primigravida.
- The thighs are flexed on the abdomen but the legs are extended on the thighs with the feet lying beside the head. The presenting part consists of the buttocks alone.

C) Incomplete breech:

Footling presentation (rare):

The thighs and legs are extended and hence the feet of the fetus lie lowermost.

Knee presentation (very rare):

The thighs are extended but the legs are flexed on the thighs and hence the presenting part will be one or both knees of the fetus



Footling

Mechanism of labor:

(A) Sacro-anterior:

- The buttock:

1 - The engaging diameter in breech presentation is bitrochanteric diameter (10 cm) which enters the pelvis in one of the oblique diameter of the pelvic inlet.

2 - The anterior buttock reaches the pelvic floor first, rotates anterior 1/8 of a circle. So, the bitrochanteric diameter will occupy the anterior-posterior diameter of the outlet.

3 - The anterior buttock hinges below the symphysis pubis and the posterior buttock is delivered first by lateral flexion of spine followed by the anterior one.

- The shoulders:

The engaging diameter is the bi-acromial (12 cm); it enters the brim in the same oblique diameter. The anterior shoulder reaches the pelvic floor first, rotates anterior 1/8 of a circle, hinges under the symphysis pubis, then the posterior shoulder is delivered first followed by the anterior one by lateral flexion of the spine.

- The after coming head:

The head usually enters the pelvis in a flexed attitude with the suboccipito-frontal diameter (10 cm) engaging in the opposite oblique diameter of the buttocks and the shoulders. Descent with full flexion of the after coming head brings the nape of the neck below the symphysis pubis (internal rotation of the occiput 1/8 of a circle anterior). The head is then delivered by a movement of flexion.

(B) Sacro-posterior:

The anterior buttock and the anterior shoulder rotates anterior 1/8 of a circle but the occiput rotates anteriorly 3/8 of a circle. So, buttocks and shoulders are delivered by lateral flexion of the spine while the after coming head is delivered by flexion..

Diagnosis:

I- During pregnancy:

(A) Abdominal examination:

- Inspection:

- There may be a transverse groove above the umbilicus in cases of sacroposterior position
- Visible localized bulging in the hypochondrium

- Palpation:

- Fundal level corresponding to the period of amenorrhea.
- Fundal grip: Head is felt with its specific characters (rounded, small, hard, ballotable and it is separated from the trunk by a sulcus).
- Umbilical grip: The back is usually felt on one side and the limbs are felt on the opposite side.
- 1st pelvic grip: Breech is felt in the lower uterine segment (irregular, larger, not ballotable and firm).

- 2nd pelvic grip: Breech is not engaged.

Auscultation:

- FHS are heard at or above the level of the umbilicus.

(B) Ultrasound is useful in :

- Diagnosis of breech presentation, its types,
- Assessment of fetal size, degree of hyperextended head.
- Diagnosis of twins, polyhydramnios,
- Exclusion of IUGR or congenital anomalies

II- During labor:

As during pregnancy and vaginal examination:

- The breech feels soft and irregular with no sutures palpable, although occasionally the sacrum may be mistaken for a hard head and the buttocks mistaken for caput succedaneum.
- The anus may be felt and fresh meconium on the examining finger is diagnostic.
- Male genitalia may be felt.
- Palpation of 3 bony prominences (2 ischial tuberosity and tip of the sacrum).
- We feel the feet with the buttocks in complete breech.
- A foot should be differentiated from the hand by:
 - Toes are all the same length, they are shorter than fingers and the big toe cannot be opposed to the toes.
 - The foot is at right angles to the leg and the heel has no equivalent in the hand.

Breech with extended legs (Frank breech) can be diagnosed by:

- Fundal level may be felt at a lower level due to early engagement of the relatively smaller buttocks.
- The fundal grip reveals that the feet are found beside the head.
- Ballottement of the head is restricted as the extended legs act as splint.
- The pelvic grip shows early engagement of the frank breech, which is smaller, firmer and more regular than a complete breech.
- The fetal heart sounds are heard at a lower level than that of the complete breech due to early engagement.
 - The feet are not palpated by vaginal examination.

	Complete Breech	Frank Breech
Parity	Common in multipara.	Common in primigravida.
Fundal leve	Corresponds to the period of amenorrhea.	Fundal level at a lower level due to early engagement.
Fundal grip	Ballottement of the head is detected.	Ballottement of the head is restricted as extended legs act as splints.
1st pelvic grip	The head is bulky, firm, irregular and not ballotable.	The breech is small, more firm, more regular and engaged.
FSH	FHS is heard at or above the level of the umbilicus.	FHS is heard below the level of the umbilicus.
PV	Feet are palpated beside the buttocks.	Feet are not palpated.
ECV	Usually succeeds.	Usually fails as the extended legs act as a splint.
US	Diagnostic.	Diagnostic.

Management of breech presentation:

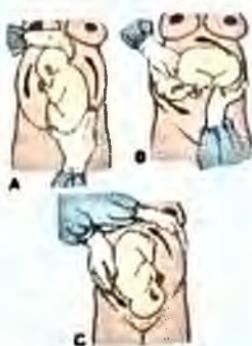
(A) Management during pregnancy:

- 1) Planned cesarean section
- 2) Planned vaginal delivery.
- 3) External Cephalic Version (ECV)

Planned cesarean section:

Some obstetricians believe that the risks to the fetus of a breech delivery are such that all cases of breech presentation should be delivered by cesarean section. Others will be restored to cesarean section for:

1. Elderly primigravidae.
2. Contracted or borderline pelvis.
3. Estimated fetal weight of 3500 gm or more.
4. Extended head.
5. Incomplete breech.
6. Premature fetus (gestational age of 25-34 weeks).
7. Prolonged rupture of membranes.
8. Unengaged presenting part.
9. Bad obstetric history.
10. Other obstetric indications for C.S. as placenta previa, previous scar.



Planned vaginal delivery:

1. Frank breech presentation.
2. Gestational age > 34 weeks.
3. Flexed head.
4. Adequate maternal pelvis.

5. No maternal or fetal indications for cesarean section.
6. Pre-viable fetus (< 700 gm).
7. Documented lethal congenital fetal anomalies.

External cephalic version

Idea:

- Vaginal cephalic delivery is safe for the mother and the fetus and to reduce the hazards of breech delivery.
- The presence of the head over the pelvic brim enables clinical evaluation of the cephalo-pelvic relationship, especially in primi-gravida.

Timing:

- At 36-37 weeks till 40 weeks (or onset of labour)

Success rate:

External cephalic version succeeds in 75% primigravida and 90% multipara.

Technique: no anesthesia /expected vulva / only torolysis (terbutaline)

- Relaxation of the abdominal muscle, which can be achieved by sedation.
- The bladder is evacuated and the patient is put in a Trandelenburg position
- Right hand lifts breech out of the pelvis. Left hand brings the head downwards. Right hand pushes the breech upwards.
- The head of the fetus is then pressed downwards in the pelvic brim and this may be helped by fundal pressure.
- If the fetus does not turn easily, the procedure should be abandoned.
- When the version is completed, the fetal heart is again auscultated and ideally a 30-minute cardiotocography recording.
- If the woman is Rhesus negative an injection of anti-D immuno-globulin is given as prophylaxis against iso-immunization caused by any placental separation.

Causes of failure:

- Obesity.
- Rigid abdominal wall
- Irritable patient who resists the manipulations.
- Irritable uterus, which undergoes contraction whenever manipulated.
- Uterine anomalies e.g. bicornuate uterus or septate uterus.
- Breech with extended legs (frank breech) commonest cause.
- Oligohydramnios or polyhydramnios.
- Oversized fetus.
- Undiagnosed twin pregnancy.
- Posterior position of the back.

Complications:

- Separation of the placenta → traumatic accidental hemorrhage.
- Pre-labor rupture of the membranes with or without cord prolapse.
- Preterm labor

- Knotting of the umbilical cord should be suspected if bradycardia persists.
- Fetal shock and intrauterine fetal death
- Rupture of the uterus (very rare)

Contraindications:

- Pre-eclampsia or hypertension because of the increased risk of placental abruption.
- Uterine scar
- Antepartum hemorrhage.
- Multiple pregnancy
- History of premature labor
- Oligohydramnios
- When CS is indicated for other reasons e.g. contracted pelvis, hydrocephalic fetus, elderly PG and bad obstetric history.

(B) Management during labor:

- 1- Management of uncomplicated breech delivery
- 2- Assisted breech delivery
- 3- Breech extraction

1- Management of uncomplicated breech delivery:

- First stage: This is managed along the same principles of normal labor.
!! Never pull on the breech before full cervical dilatation.
- Second stage:

1- Spontaneous breech delivery:

The buttocks, the shoulder and the head are delivered spontaneously without any assistance. This occurs only in precipitate labor when the uterine contractions are strong, multipara, pelvis is roomy and premature baby.

2- Assisted breech delivery:

We assist delivery of the shoulder and after coming head.

Delivery of the buttocks:

- A generous episiotomy is done with local infiltration when the perineum is maximally distended:
 - To prevent perineal laceration
 - To prevent intracranial hemorrhage due to sudden compression and decompression of the after coming head.

- The woman is encouraged to push with the contraction and the buttocks are delivered spontaneously.

Delivery of the shoulder:

- • When the anterior scapula appears, bring down both arms by hooking your finger at the bent of the elbow and bring the arm from the front of the fetus.
- • Keep the back of the fetus anterior so as to bring the occiput behind the symphysis pubis.

The after coming head:

Is delivered by one of the following methods:

- 1) Burns-Marshall Technique (the most dangerous)
- 2) Mauriceau-Smellie-Velt technique (jaw-flexion shoulder traction)
- 3) Forceps (Piper forceps).

(A) Burns-Marshall Technique (the most dangerous):

The fetus is left hanging as its weight will exert gentle traction and promote flexion of the head until the suboccipital region appears below the symphysis pubis and then catch the fetus from its feet and turn it towards the mother's abdomen.



(B) Mauriceau-Smellie-Velt technique (jaw-flexion shoulder traction) (the most common):

The index finger of the same hand is introduced in the child's mouth to effect jaw flexion. The index and middle fingers of the other hand are applied over the shoulders to enable traction to be carried out in a downward and forward direction.



(C) Forceps (Piper forceps).

3- Breech extraction:

Gentle traction on legs, helped by fundal pressure during uterine contraction will deliver breech trunk as far as shoulder girdle and complete delivery of the shoulders and after-coming head as in assisted breech delivery.

Indications:

- 1- Maternal or fetal distress in the 2nd stage of labor.
- 2- Prolonged 2nd stage e.g. inertia.
- 3- Delivery of retained 2nd twin.
- 4- Prolapsed pulsating cord, the cervix is fully dilated.
- 5- Frank breech.

4- Management of complicated breech delivery (due to):

- 1- Arrest of the buttocks
- 2- Arrest of the shoulders
- 3- Arrest of the after coming head

Arrest of the buttocks:

A. Arrest of the buttocks at the inlet:

1- Contracted pelvis → cesarean section.

2- Large fetus → cesarean section.

3- Uterine inertia: IV pitocin drip

B. Arrest of the buttocks at the outlet :

1- Large sized fetus and pelvic outlet contraction → CS.

2- Rigid perineum → episiotomy with breech extraction.

3- Uterine inertia → brings down a leg after disimpaction of breech upward with breech extraction.

4- Breech with extended legs (Frank breech)→

if buttocks engaged.....groin traction

if buttocks not engaged.... Pinard method

Arrest of the shoulders:

A. Extension of the arms:

(1) Classical method: (Bringing down an arm)

Bring down the posterior arm first as there is more space following that, the anterior arm is brought down in a similar manner.

(2) Lovest maneuver:

It is done when the inferior angle of the scapula appears below the pubic arch; steady gentle traction is applied on the trunk of the fetus, and is rotated to the other side and then brought back to its original side. This is repeated two to three times keeping the back anterior; ultimately one or both arms become flexed and the elbow is seen at the introitus.



B. Nuchal position of the arm:

The forearm lies behind the neck due to rotation of the trunk in the wrong direction.

Management

Rotate the fetal back in the direction of the fingertips of the displaced arm.

Arrest of the after coming head:

The after coming head may be arrested at the pelvic brim, cavity or outlet.

(A) Passages (causes and management):

▪ Contracted pelvis:

- If the fetus is dead (common) → do craniotomy.
- If the fetus is living → symphysiotomy.

▪ Rigid perineum:

- Episiotomy.

- Incompletely dilated cervix:
 - If the fetus is living → cervical incisions (Duhressen's incisions).
 - If the fetus is dead → wait for full cervical dilatation.

(B) Head

- Large head:
 - If the fetus is dead (common) → do craniotomy.
 - If the fetus is living → symphysiotomy.
- Extension of the head:
Jaw flexion: Shoulder traction, till the occiput appear below the symphysis pubis, then left the fetus towards the mother's abdomen to deliver the head in flexion.
- Posterior rotation of the head:

Occipito-posterior positions assumed by the after-coming head is due to negligence of the attendant to help anterior rotation of the occiput during delivery.

This position may give rise to delay, which is managed in the following manner:

1- If the head is well flexed:

- Anterior rotation of the occiput.
- If fails → jaw flexion shoulder traction in a posterior direction and the delivery is completed as face to pubis.

2- If the head is extended:

Prague's maneuver.

Here, the feet of the fetus are grasped by the hand and the fetus is brought towards the mother's abdomen, thus flexing the head; the fingers of the other hand are forked on the shoulders from behind to perform downward traction and deliver the head.

Complications of breech delivery:

(A) Maternal complications:

- Prolonged labor leading to maternal exhaustion.
- Cervical, vaginal, perineal laceration and even rupture uterus.
- Postpartum hemorrhage.
- Puerperal infections.

(B) Fetal complications:

1- Fatal complications:

The fetal and the neonatal mortality rates are more in breech deliveries.

These increased fetal and neonatal mortality rate are due to:

(a) Intracranial hemorrhages:

Commonest cause of fetal mortality (45%) of cases due to:

- Sudden compression and decompression of the fetal head.
- Asphyxia(it causes vasodilation and necrosis of the vascular wall).



- Head injury (due to rough supra-pubic pressure).

Prevention:

- 1- Prevention of asphyxia.
- 2- Slow delivery of the head.
- 3- Avoid too energetic suprapubic pressure by the assistant.
- 4- A generous episiotomy to avoid excessive compression of the head.
- 5- Forceps application for aftercoming head.
- 6- Vitamin K (10 mg) early in labor.

(b) Asphyxia neonatorum:

30% of cases of fetal mortality due to:

- Pressure over the cord by the shoulder or the head more than 10 minutes.
- Premature respiration (avoided by warm towels).
- Cord prolapse.

Prevention:

- 1- Withdrawal of a loop of cord after trunk delivery.
- 2- Cover the body of the fetus with a warm towel.

(c) Fracture dislocation of the cervical spine:

20 % of fetal mortality

It can be avoided by delaying extension of the head towards the mother's abdomen until the occiput appears below the pubic arch.

(d) Rupture of liver and spleen due to rough manipulations: 3% of fetal mortality.

Prevention: By grasping the fetus from the hip bones and not from the abdomen.

2- Non-fatal complications:

- (a) Fractures: of the femur, humerus, clavicle and the mandible.
- (b) Dislocation of the hip, shoulder and elbow joints.
- (c) Nerve injury: Brachial plexus palsy (Erbs, Klumpke) and facial palsy.
- (d) Rupture of sternomastoid .
- (e) Injury to external genitalia.

Shoulder presentation (transverse or oblique lie)

LEARNING OBJECTIVES:

- To list the causes of shoulder presentation
- To state how to diagnose shoulder presentation
- To describe the complications and diagnosis of neglected shoulder
- To state the management of shoulder & neglected shoulder presentation

Definition:

- Any presentation in which the longitudinal axis of the fetus crosses the longitudinal axis of the mother with the head on one side and breech on the opposite side of the middle line.
- The lie may be transverse or oblique lie.
- Any part of the lateral border of the fetus may present. The commonest part is the shoulder (Shoulder presentation)

Incidence:

1/200 deliveries common in multipara.

Etiology:

Fault in power:

Pendulous abdomen (laxity of abdominal and uterine muscles). This is the most common cause and is found in multigravidae particularly those of high parity.

Fault in passages:

- 1- Contracted pelvis: common in primigravida.
- 2- Congenital malformation of the uterus as bicornuate, subseptate or arcuate uterus.
- 3- Tumors of the uterus as cervical fibroid or low uterine fibroid.
- 4- Placenta previa or fundal insertion of the placenta.

Fault in passengers:

- 1- Prematurity.
- 2- Intra-uterine fetal death
- 3- Polyhydramnios.
- 4- Multiple pregnancy.
- 5- Fetal anomalies.

Position:

Scapula is the denominator.

There are 4 positions depending on the position of the back and direction of the head.

1st: Back anterior, head to the left → Left Scapulo-Anterior (LSA)

2nd: Back anterior, head to the right → Right Scapulo-Anterior (RSA)

3rd: Back posterior, head to the right → Right Scapulo-Posterior (RSP)

4th: Back posterior, head to the left → Left Scapulo-Posterior (LSP)



RSP



LSP



RSA



LSA

Scapulo-anterior is more common than scapulo posterior as the concavity of the front of the fetus fits into the convexity of maternal spine.

Mechanism of labor:

No mechanism of labor and labor is obstructed.

A – Full term living baby

Rarely before rupture of the membranes and early in labor (spontaneous rectification) into vertex or (spontaneous version) into breech presentation.

B - Premature or macerated fetus:

- Spontaneous expulsion (partus conduplicato corpore):

The fetus is folded like the letter V and expelled through the birth canal.

- Spontaneous evolution:

The head is retained above the pelvic brim, the neck become greatly elongated, the arm and the shoulder descend to lie under the pubic arch and as they emerge form the pelvis, they allow space for the breech to descend along the face of the fetus to be delivered followed by the trunk and after coming head.

Diagnosis:

(A) During pregnancy:

- Inspection:

▪ Fundus is below its normal level for the period of gestation.

▪ The abdomen is broader from side to side.

- Palpation:

▪ Fundal level: lower than the period of amenorrhea.

▪ Fundal grip: empty (no head or breech).

▪ Umbilical grip: the head is felt on one side and the breech on the other side.

▪ Pelvic grip: (empty (No head or breech).

- **Auscultation:**
- FHS at the side of umbilicus towards the head.
- **Ultrasonography and X-ray:**
- Confirm the diagnosis
- Exclude any abnormality in the fetus or the pelvis

(B) During labor:

- **Vaginal examination:**
- Slow dilatation of the cervix, protruding membrane, and high presenting part with premature rupture of the membrane with prolapse of the arm or cord is common.
- After rupture of the membranes and the cervix is sufficiently dilated, the presentation can be recognized by palpating the sides of the thorax and feeling its parallel bony ribs.
- In impacted cases late in labor, we can feel scapula, acromion, clavicle axilla (shoulder).
- If prolapse of arm occur, the dorsum of prolapsed supinated hand point to the back and the direction of the thumb point to the position of the head (Barcal's sign).

Management:

During pregnancy:

External Cephalic Version (ECV) (better) or External Podalic Version (EPV) can be done after 32 weeks and even in the first stage of labor as long as the membranes is intact, provided that no placenta previa, uterine abnormalities or contracted pelvis which require elective cesarean section.

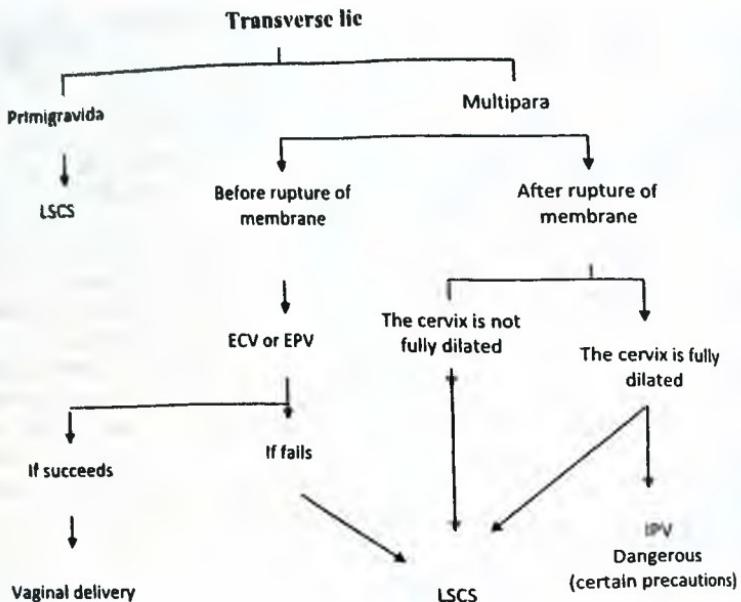
During labor:

- Most obstetricians will perform LSCS.
- Some will do external cephalic version after exclusion of other indications for CS:
 - Elderly PG
 - Contracted pelvis
 - Placenta previa
 - Prolapsed pulsating cord or fetal distress
- Internal podalic version is rarely done with the following precautions:
 - The cervix is fully dilated.
 - Membrane is recently ruptured.
 - Amniotic fluid is not drained.
 - The uterus is not tonically retracted on the fetus
 - Easy vaginal delivery (no contracted pelvis).

1st stage	2nd stage
<p>1- Exclude indications for CS:</p> <ul style="list-style-type: none"> • Elderly PG • Contracted pelvis • Placenta previa • Prolapsed pulsating cord or fetal distress <p>2- External version:</p> <p>Intact membrane:</p> <ul style="list-style-type: none"> • ECV (better) + AROM + Abdominal binder <p>3- If external version fails → LSCS</p> <p>If PROM → LSCS</p> <p>4- Bipolar Podalic Version (BPV) and bring down a leg until full cervical dilatation (not used nowadays) (unsafe for the mother and fetus)</p>	<p>1- Membrane intact → ECV</p> <p>2- Better LSCS</p> <p>3- Internal podalic version is done with the following precautions:</p> <ul style="list-style-type: none"> • The cervix is fully dilated. • Membrane is recently ruptured. • Amniotic fluid is not drained. • The uterus is not tonically retracted on the fetus • Easy vaginal delivery (no contracted pelvis) <p>4- Dead fetus → decapitation</p>

Indication of CS:

1. Contracted pelvis.
2. Large fetus.
3. Neglected or impacted shoulder.
4. Partially dilated cervix and rupture of membranes.
5. Elderly primigravida.
6. Other obstetric indication for C.S.



Complication:

- **Maternal risks:**

As malpresentation

- **Fetal risks:**

Mortality is high due to:

- Asphyxia.
- Prolapse of the cord.
- Operative trauma.

Impacted and neglected shoulder

Definition:

- **Impacted shoulder:**

Shoulder presentation in which the acromio clavicular joint lies below the level of ischial spines but does not appear at the vulva, labour is obstructed but the baby is living.

- **Neglected shoulder:**

Shoulder presentation in which the acromio- clavicular joint appears at the vulva, labour is obstructed but the baby is dead.

Neglected shoulder = obstructed labor = impending rupture uterus.



Clinical picture:

History:

- Prolonged labor.
- Membranes are ruptured since a long time.
- Labor pains are frequent and strong.

General examination:

- The patient is exhausted.
- There are rapid pulse, raised temperature, dry tongue and cracked lips due to dehydration.

Abdominal examination:

- The uterus is hard and tender on palpation.
- The uterus is tetanically contracted, rapid and strong contraction with little or no relaxation in between, so the patient feels constant abdominal pain.
- The fetal parts are difficult to be felt.
- FHS are usually inaudible or severely distressed.
- Rising retraction ring (pathological retraction ring) or Bandl's ring.
- Transverse groove is seen and felt abdominally.

Vaginal examination:

- Edema of vulva
- The vagina is dry, ballooned and hot
- The cervix is fully dilated or edematous and hanging
- The prolapsed arm is cold, cyanotic and edematous
- The prolapsed cord if present is not pulsating

Management:

An immediate cesarean section is performed under anesthesia regardless of whether the fetus is alive or dead, as attempts at manipulative procedures or destructive operations can be dangerous for the mother, resulting in rupture uterus.

Mechanism of labor in neglected shoulder:

- With an average fetus, an average size pelvis there will no mechanism of labor→ Labor became obstructed.
- The effect of uterine contractions is to push the shoulder deeper and deeper into the pelvis and the membrane will rupture.
- The arm, cord or both become protruding through the cervix and even outside the vagina. The uterus becomes molded over the fetus with over stretching of the lower uterine segment.
- If the condition is not managed, the uterus undergoes rupture.

Compound (complex) presentation

LEARNING OBJECTIVES:

- To define complex presentation and list its causes
- To state how to diagnose and manage complex presentation
- To describe the complications associated with complex presentation

Definition:

The prolapse of one or more the fetal limb beneath or beside the presenting head. The hand is commoner than the foot.

Incidence: 1/700.

Etiology: As cord presentation and prolapse.

Diagnosis:

By vaginal examination and exclude cord prolapse.

It has to be differentiated from:

- 1- Shoulder presentation with arm prolapse.
- 2- Footling presentation.



Management:

- 1- Manual reposition and spontaneous delivery.
- 2- Manual reposition and forceps delivery; if there is fetal or maternal distress and the cervix is fully dilated.
- 3- Cesarean section:
 - Contracted pelvis
 - Elderly primigravida
 - Large sized fetus

Unstable (variable) lie

Definition:

The lie is defined as unstable when after 36 weeks gestation, instead of remaining longitudinal; it varies from one examination to another between longitudinal and oblique or transverse.

Etiology:

Any condition in late pregnancy that increases the mobility of the fetus or prevents the head from entering the pelvic brim may cause this.

- Pendulous abdomen in multigravidae (laxity of uterine and abdominal muscles)
- Contracted pelvis
- Polyhydramnios.
- Placenta previa

Danger:

If the lie remains unstable after the end of 36 weeks, one faces the danger that labor may supervene and the membranes are likely to rupture easily if the lie is oblique with cord prolapse.

Management:

- Ultrasonography for fetal size, placenta previa, pelvic tumour and polyhydramnios.
- The patient is examined at the end of 38 weeks of pregnancy.
 - 1st exclude contracted pelvis → CS.

The cervix is ripe:

- Fetal lie is longitudinal → induction of labor.
- Fetal lie is oblique or transverse → external cephalic version followed by rupture of membranes to maintain longitudinal lie during labor → induction of labor.
- If version failed, CS is done.

The cervix is unripe:

- Re-examine the cervix weekly till the end of 40 weeks.
- If cervix become rip, proceed as before.
- If cervix is still unripe, CS is safer for the mother and fetus.

Cord presentation and cord prolapse

LEARNING OBJECTIVES:

- To define cord presentation and prolapse and list their causes.
- To describe the complications associated with cord presentation and prolapse.
- To state how to diagnose cord presentation and prolapse.
- To describe the different ways of management of cord presentation and prolapse.

Definitions:

The descent of the cord below the presenting part with:

- Intact membranes → cord presentation.
- Ruptured membranes → cord prolapse.

If the cord lies beside but not below the presenting part is called "occult cord prolapse".



Etiology:

A) Interference with adaptation of the presenting part to pelvic brim:

- Fetal causes:
 - Malpresentation e.g. shoulder, breech, OP
 - Prematurity
 - Twins
 - Hydraminos
- Maternal causes:
 - Contracted pelvis e.g. flat pelvis
 - Pelvic tumors
- Predisposing factors:
 - Long cord.
 - Low insertion of the placenta as PP.
 - Sudden rupture of membranes in cases of hydraminos.

Diagnosis: By vaginal examination only during labor if:

- The membranes are intact → cord presentation.
- The membranes are ruptured → cord prolapse.

We must feel if the cord is pulsating or not.

Occult cord prolapse is suspected if continuous monitoring shows variable decelerations in fetal heart rate.

Management:

A) Cord presentation:

1- CS when indicated:

- Malpresentation.
- Contracted pelvis.
- Placenta previa.
- Uterine scar.

2-



Prevent PROM by:

- Trendelenburg position
- Avoid repeated vaginal examination
- Avoid straining
- Avoid high enema

Rupture membranes and immediate delivery:

- Cephalic and head engaged → Forceps
- Cephalic and head not engaged → CS
- Breech → Breech extraction
- Shoulder → IPV and breech extraction

B) Cord prolapse:

Pulsating



CS if there is any indication
e.g. contracted pelvis

Non-pulsating



No interference and left for
spontaneous delivery



If the cervix is fully dilated

If the cervix is partially dilated



Immediate delivery.
Forceps, if cephalic
Breech extraction, if breech
IPV, if shoulder

The best is CS

Reposit the cord and wait full
cervical dilatation (alternative
for CS)

Cord prolapse usually recur.

To improve fetal oxygenation during preparation for CS:

- 1- Trendelenburg position, knee-chest position or exaggerated Sim's position.
- 2- The patient lies on her left side.
- 3- Oxygen mask

Prognosis:

The fetal mortality is high.

As long as the membranes are intact, there is no danger to the fetus. After rupture of membrane fetal asphyxia occurs due to:

- Compression of the cord between the presenting part and the cervix or bony pelvis.
- Spasm of the umbilical vessels following exposure to cold or manipulation.

Prognosis is more worse in the following (more compression of the cord):

- 1- Cord prolapse than cord presentation.
- 2- Primigravida than multipara.
- 3- Generally contracted than flat pelvis.
- 4- Partially than fully dilated cervix.
- 5- Cephalic than breech or shoulder.
- 6- Anterior than posterior position of cord.

Exaggerated Sim's position: Pillow

wedges are used to alleviate the women's buttocks to relieve the pressure on the umbilical cord



Knee chest position: Pressure in the umbilical cord is relieved as the fetus gravitates towards the fundus



Multiple pregnancies

LEARNING OBJECTIVES:

- To describe the types of twinning and list the modes of placentation and its time onset.
- To describe the methods of diagnosis during pregnancy & mention the different presentations
- To list complications in pregnancy and labor.
- To describe types and complications of fetal transfusion syndrome and conjoined twins
- To describe lines of management during pregnancy
- To recognize plan of the delivery methods and list indications of CS

Definition:

The term 'multiple-pregnancy' is used to describe the presence of more than one fetus in utero.



Incidence:

- Incidence of twins is 1/80, triplets 1/(80)2, quadruplets 1/(80)3 (Hellin's formula).
- Racial and hereditary factors are present.
- The incidence has increased after the use of ovulatory drugs and with advancing age and high parity.

It results from fertilization of one ovum by one sperm giving rise to one zygote which undergoes division at various stages of development.

Sex: Identical.

Features: Identical. However, they are different in fingerprints, iris pattern and voice.

There are intercommunication of circulation. So, you must clamp the cord after delivery of the 1st twin, otherwise the 2nd twin may bleed to death.

Types (according to stage of development at which splitting of the ovum occurs):

1- Dichorionic diamniotic:

- (2 placentae, 2 chorion, 2 amniotic sacs, 2 cords and 2 separate fetuses):
Splitting (within 3 days after fertilization) occurs at the morula stage before differentiation of the chorion and amnion.

2- Monochorionic diamniotic:

- (1 placenta, 1 chorion, 2 amniotic sacs, 2 cords and 2 separate fetuses):
Splitting (4-8 days after fertilization) occurs at the blastocyst stage after differentiation of the chorion but not the amnion.

3- Monochorionic monoamniotic:

- (1 placenta, 1 chorion, 1 amniotic sac, 2 cords and 2 separate fetuses):
Splitting (8-13 days after fertilization) occurs after differentiation of both chorion

and amnion.

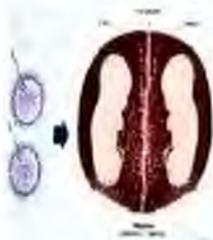
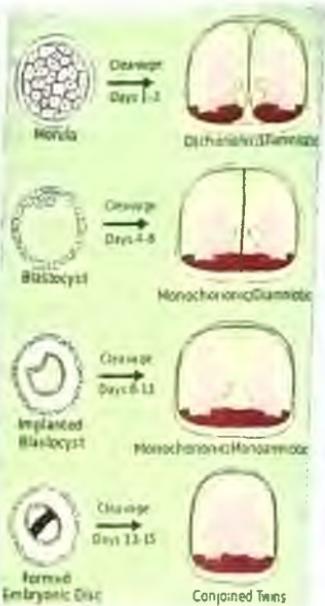
4- Conjoined twins:

- (1 placenta, 1 chorion, 1 amniotic sac, 2 cords and 2 conjoined fetuses):
- Splitting (more than 13 days after fertilization) occurs after development of embryonic discs.
- So, cleavage is incomplete → conjoined or Siamese twins.
- The commonly shared body site may be:
 - Anterior → thoracopagus (commonest)
 - Posterior → pyopagus
 - Cephalic → craniopagus
 - Caudal → ischiopagus

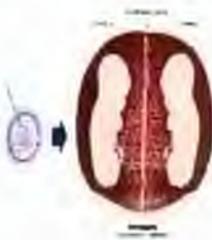
I- Binovular twins (heterologous) dizygotic:

Twins are developed from 2 separate fertilized ovum.

- Twins may or may not be of the same sex, not identical but like brother and sisters.
- 2 placenta, 2 chorion, 2 cord and 2 amniotic sac.
- No intercommunication of circulation.



Binovular twin



Uniovular twin



Conjoined twin

Monozygotic or uniovular	Dizygotic or binovular
One ovum	Two ova
One spermatozoon	Two spermatozoa
One placenta	Two placentae (may be found)
One chorion (rarely two)	Two chorions
Two amnions (rarely one)	Two amnions
Two cords	Two cords
The same sex	Different sexes or the same sex
Intercommunication of circulation	No intercommunication of circulation

Superfecundation:

Fertilization of 2 separate ova released in the same cycle by 2 separate spermatozoa from 2 separate act of coitus. The birth of twins having different racial characteristics and bearing different paternal features supports this belief.



Supertetation:

Fertilization of 2 separate ova released at 2 different cycles by 2 separate spermatozoa. It does not occur in human as ovulation is suppressed by pregnancy.

Diagnosis of twin pregnancy:

I. History:

Past or family history of twins.

- History of treatment with ovulatory drugs.
- Exaggerated symptoms of pregnancy e.g. nausea and vomiting

Superfecundation

II. Abdominal examinations:

- Inspection:
 - Oversized abdomen
 - The uterus may look broad or round.
 - Fetal movement may be seen over a wide area.
 - Fresh striae gravidarum may be apparent.
- Palpation:
 - Fundal level > period of amenorrhea.
 - Palpation of 4 poles (2-head, 2-breech). However at least 3 poles should be palpated.
 - Palpations of small size head in relation to the size of the uterus.
 - Lateral palpation may reveal two fetal breech or many limbs on both sides.
- Auscultation:
 - Two separate points of maximum intensity are heard at the same time by two observers with a difference of 10 or more beats/minute.

- Gallop sound may be heard due to superimposed of 2 FHS (Arnaux sign).
- Ultrasound:
- Diagnosis of twin from as earlier as 8 week gestation.
- Determination of twin zygosity (number of placenta and chorion):
 - Monoamniotic twins: no dividing membrane only in monozygotic twins.
 - Diamniotic twins: dividing membrane is present:
 - Monochorionic: the dividing membrane between the 2 sacs is thin and consists of 2 layers (Tau sign).
 - Dichorionic: the dividing membrane between the 2 sacs is thick and consists of 3 layers (Lambda sign).
- Detection of presentation, position and maturity.
- Detection of congenital anomalies and conjoined twin.
- Exclude intrauterine fetal death.
- Detection of polyhydramnios and placental site.

III. Vaginal examination during labor:

The presenting part is small in proportion of the over sized abdomen.

Management:

(A) Antenatal management:

- 1- Dietary advice with supplementation of iron, vitamins and folic acid to keep the Hb% at an acceptable level.
- 2- Food rich in iron, folic acid, vitamins and calcium should be advised and an adequate protein intake is essential.
- 3- Less salt intake in the diet to guard against PIH.
- 4- More rest to avoid premature labor.
- 5- For relief of discomfort in later pregnancy it may be helpful for the mother to wear a light weight support girdle or support thighs.

(B) Delivery :

The obstetrician, pediatrician and obstetric anesthetist should be present for the delivery because of the risk of complications.

Timing:

A – Gestational age:

- Chorionic twins: at 38-39 weeks.
- Monochorionic twins: at 36- 38 weeks.
- Monoamniotic twins: earlier delivery may be indicated as complications as cord entanglement are common (32 weeks in some cases).

B – Maternal condition

Development of any complication indicating delivery e.g. preeclampsia

C – Fetal condition

Non reassuring fetal heart rate, non-reassuring biophysical profile or IUGR.

Mode of termination:

Indications of CS in multiple pregnancy:

- Shoulder presentation of the first twin.
- Fetal distress or prolapsed pulsating cord before full cervical dilatation.
- Other obstetric indication as:
 - Scar in the uterus.
 - Severe pregnancy induced hypertension or aggravated hypertension.
 - Contracted pelvis.
 - Elderly premigravida.
- Retained living 2nd twin when:
 - Shoulder presentation.
 - The uterus is molded over the fetus.
 - The cervix is reformed.
- Conjoined twins and triplets or more with reasonable degree of postnatal survival.

Vaginal delivery:

In the absence of any obstetric factors for CS, twins should be allowed to deliver vaginally if the first is in a vertex presentation.

Intra-natal assessment:

- Delivery in a well-equipped hospital.
- Early admission once in labor or rupture of membranes.
- Determination of the lie, presentation and FHR of each baby (ultrasound is helpful).
- Maternal and fetal monitoring.

Delivery of the first twin:

- Vaginal delivery is allowed with careful observation.
- After delivery of the 1st fetus, the uterus usually takes a short time of rest before it regains its contraction. An abdominal examination is done to ascertain the lie, presentation and position of the second fetus and to auscultate the fetal heart.
 - Longitudinal lie → rupture of the membrane and leave it for spontaneous delivery.
 - Transverse or oblique lie → ECV then rupture of the membrane and abdominal binder or internal podalic version with breech extraction.
- If extraction of the second fetus is delayed more than $\frac{1}{2}$ hour or fetal distress.
 - Forceps if the head is engaged.
 - Internal podalic version and breech extraction if the head is not engaged.
 - Breech extraction if breech presentation.
- Delay of delivery of the 2nd twin over one hour may cause:
 - Reformation of the cervix.
 - Prolapse of the cord.

- Mature separation of the placenta
- Intra-amniotic infection.

(C) Post partum management :

- After both babies have been delivered, ergometrin is given and, controlled cord traction is applied to both cords simultaneously and delivery of the placenta should be effected without delay. Emptying the uterus enables the control of bleeding and prevention of postpartum hemorrhage.
- Care of the neonate.

Effect (complications) of twin pregnancy:

Effects of twins on pregnancy:

- Exacerbation of minor disorders as morning sickness, nausea and heart burn.
- Iron deficiency anemia and folic acid deficiency anemia
- Pregnancy induced hypertension (pre-eclampsia)
- Polyhydramnios
- Pressure symptoms
- Abortion and preterm labor which is avoided by more rest, cervical cerclage and B adrenergic drugs as Ritodrins
- Placenta previa (large placenta) and accidental hemorrhage
- Malpresentation and non-engagement of the head

Effect on labor and puerperium:

- Prolonged labor due to over distension and malpresentation → inertia.
- Premature rupture of the membranes and prolapse of the cord due to malpresentation and polyhydramnios.
- Locked twins.
- Conjoined twins → obstructed labor.
- Retained 2nd twins.
- Premature expulsion of the placenta, before the delivery of the second twin with the risk of severe asphyxia and death of the second twin in monozygotic twins.
- Postpartum hemorrhage due to uterine atony, wide placental area and placenta previa.
- Puerperal sepsis due to premature rupture of membranes and manipulation, prolonged labor and subinvolution of the uterus.

Effect on the fetus:

- Prematurity.
- Asphyxia.
- Congenital anomalies and conjoined twins
- Intra-cranial hemorrhage
- Birth trauma
- SGA, FGR and low birth weight
- Twin to twin transfusion syndrome

Perinatal mortality:

- 13.9%.
- Monozygotic twin > dizygotic twin 2.5:1.

Special situations:

The discordant twins:

- One fetus shows abnormally increased growth, while the second shows small for gestational age with a difference in fetal weights more than 25 %.
- This condition may be due to :
 - Genetic syndromes.
 - Twin to twin transfusion syndrome.

Twin to twin transfusion syndrome:

This is due to unbalanced vascular anastomosis within a monochorionic placenta.

(A) The hypoperfused twin (Donor) will

have:

- Anemia
- Hypovolemia.
- Hypotension
- Microcardia (fetal acardiacus).
- Oliguria
- Oligohydramnios in its sac.
- In marked hypoperfused twin, it may die in utero.



Twin to twin transfusion

(B) The hyperperfused twin (Recipient) will have:

- Polychthemia.
- Hypervolemia.
- Hypertension.
- Cardiomegaly.
- Increase urine formation.
- Polyhydramnios in its sac.

Treatment: septostomy or laser ablation of the anastomosis.

Single fetal demise: death of one fetus during pregnancy

a- In the 1st trimester:

- There is minimal risk to the mother.
- Pregnancy is allowed to continue while the second fetus is closely monitored.

b- In the 2nd or 3rd trimester:

- Pregnancy commonly continues but the risk of hypofibrinogenemia and DIC is higher.
- Close monitoring of maternal bleeding and coagulation profiles.
- Delivery of the living twin should be attempted once it can survive conditions outside the uterus, or if maternal hazards as DIC are anticipated.

The vanishing twin syndrome:

- Early in the 1st trimester, one embryo dies then disappear while the 2nd continues to grow in a normal pattern.
- The condition is diagnosed and followed up by ultrasound.

Fetus compressus or papyraceous:

One fetus may die and become compressed while the other fetus continues to grow (**fetus compressus**) or may be markedly flattened through loss of fluid and most of soft tissues.

Locked twins:

This is rare but serious complication of twin pregnancy. There are two varieties:

- 1- Locking of 2 fore-coming head which become impacted (cephalic-cephalic).

(**CS is the best line of treatment**)

- 2- Locking after coming head of the first child by fore-coming head of the 2nd child (breech-cephalic).

- Under general anesthesia, attempts should be made to push up and hold up the head of 2nd twin (Disimpaction) while the 1st is delivered by breech extraction.
- The chance of survival of 1st baby is nil, sacrifice the first fetus which is usually dead by decapitation to deliver the 2nd fetus, and finally removed the served head of 1st fetus with more liability to rupture uterus.
- So, the best treatment is C-S with vertical incision in LUS.



Locked twin

Complications of third stage of labor

LEARNING OBJECTIVES:

- To define post-partum hemorrhage and differentiate between its types
- To define causes and risk factors for post-partum hemorrhage
- To recognize and apply measures for prophylaxis of post-partum hemorrhage
- To describe first aid management and outline treatment modalities for each type of post-partum hemorrhage.

Postpartum hemorrhage (PPH)

Definition:

- Postpartum hemorrhage (PPH) is excessive blood loss from or within the reproductive tract after delivery sufficient to affect the general condition of the mother as shown by tachycardia and/or hypotension.
- The traditional definition based on a blood loss ≥ 500 mL (in vaginal delivery) or ≥ 1000 mL (in CS), is difficult to estimate in clinical practice.

Types of PPH:

- Primary PPH: within the first 24 hours
- Secondary PPH: after the first 24 hours up to the 42nd day postpartum

Primary postpartum hemorrhage

Causes:

- 1) Placental site: (80%).
 - Atonic uterus;
 - Retention of a partially or completely separated placenta.
 - Blood coagulation defect- such as hypofibrinogenemia.
- 2) Extra-placental site: (20%).
 - Traumatic e.g. uterine rupture or lacerations of the cervix, vagina and perineum.

Predisposing factors

A. Uterine atony

- Causes in the patient:
 - History of previous PPH.
- Causes in the uterus:
 - Multiple fibroids
 - Malformed uterus interfering with proper contraction.
- Causes during pregnancy:
 - Anemia and malnutrition
 - Antepartum hemorrhage (placenta previa and placental abruption)
 - Amniotic infection due to prolonged ROM and chorioamnionitis

- Over distended uterus due to polyhydramnios, multiple pregnancy, or macrosomia.
- Causes during labor:
 - 1st stage
 - Prolonged 1st stage
 - Induction of labor
 - Overuse of sedation
 - Full bladder and full rectum.
 - 2nd stage
 - Prolonged 2nd stage
 - Precipitate labor
 - Anesthesia e.g. halothane.
 - 3rd stage
 - No active management
 - Retained parts.
- **B. Genital tract trauma**
 - A precipitate delivery or operative delivery
 - Malposition or deep engagement of the fetal head and/or lacerations during a CS
 - Previous uterine surgery predisposes the genital tract to a uterine rupture.

Diagnosis

History

- **Obstetric history including:**
 - History of any of the previously mentioned risk factors
 - Number, mode, and outcome of previous deliveries
 - History of the events of the current delivery e.g.
 - Where it took place
 - Were uterine stimulants used?
 - Was delivery obstructed or instrumental?

Physical examination

- **General examination:**
 - Vital signs (pulse, BP)
 - Shock is manifested early by dizziness, weakness or sweating, and manifested late by restlessness, pallor, shortness of breath and/or collapse.
 - In a patient with hypertension or pre-eclampsia, severe blood loss may give a misleading "normal" blood pressure reading.
- **Abdominal examination**
 - Consistency of the uterus (lax or firm)
 - Uterine fundal level
 - Any abdominal tenderness or rigidity

- Scars from previous operations.
- Local examination
 - Assess the amount of vaginal bleeding.
 - Look for lacerations (perineal, vulvar, vaginal or cervical).
 - Determine whether the placenta has been delivered.
- Laboratory investigations
 - CBC, ABO grouping and Rh type.
 - Bleeding time
 - Coagulation time

Cause of PPH as determined by history and clinical examination

History	Atonic postpartum hemorrhage	Traumatic postpartum hemorrhage									
	Prolonged labor	Instrumental delivery									
General examination	The amount of revealed bleeding may be out of proportion to the general condition and the shock as some blood accumulates inside uterus	The amount of revealed bleeding is in proportion to the general condition and the degree of shock									
Abdominal examination	<table border="1"> <tr> <td>Fundal level</td> <td>Higher than expected (uterus is large)</td> <td>Uterus is not enlarged.</td> </tr> <tr> <td>Consistency</td> <td>Uterus is lax.</td> <td>Uterus is firm (contracted)</td> </tr> <tr> <td>Local examination</td> <td>Dark blood (retained blood) No lacerations</td> <td>Bright red blood (fresh) Lacerations</td> </tr> </table>	Fundal level	Higher than expected (uterus is large)	Uterus is not enlarged.	Consistency	Uterus is lax.	Uterus is firm (contracted)	Local examination	Dark blood (retained blood) No lacerations	Bright red blood (fresh) Lacerations	
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Consistency	Uterus is lax.	Uterus is firm (contracted)									
Local examination	Dark blood (retained blood) No lacerations	Bright red blood (fresh) Lacerations									

* In some cases, atonic and traumatic types are combined.

Management

- 1) Prophylactic measures:
- Preventive care during the antenatal period
 - Recognize risk factors.
 - Perform routine laboratory investigations to diagnose anemia at an early stage.
 - Ensure iron and folic acid supplementation.
 - Preventive care during labor and delivery
 - Identify patients at risk of developing PPH.
 - Active management of the third stage of labor
 - Administer 10 IU of oxytocin IM with the delivery of the anterior shoulder.
 - Perform controlled cord traction to deliver the placenta.
 - Perform uterine massage.

2) Active management:

- Communication:

- With all relevant professionals e.g. midwife, obstetrics and anesthetic staff and blood transfusion laboratory.

- Resuscitation:

- Insert two wide bore IV cannula (size 16 or 18),
 - Cross match 2 units of blood and perform required investigations before starting any IV fluids.
 - Administer an IV crystalloid solution (saline or Ringer's lactate) at a fast drip (1 L/hour) and start ecbolic administration.

- Monitoring and investigations:

- Continuously monitor pulse and BP every five minutes.
 - Insert a Foley catheter and monitor urine output.
 - Massage the uterine fundus.
 - Documentation of fluid balance, blood, blood products given and procedures performed.
 - Exclude causes other than uterine atony

- Arrest of bleeding:

- i. Hemorrhage after delivery of the neonate, before delivery of the placenta (retained placenta).
 - Administer Ergometrine 0.2 mg (1 ampule) IM or give misoprostol 800-1000 mg, followed by controlled cord traction to deliver the placenta.
 - Avoid forceful cord traction and fundal pressure as they may cause uterine inversion, if failed try Manual removal of the placenta
- ii. Hemorrhage immediately after delivery of the placenta (retained blood clots or placental fragments).
 - Explore the perineum, vagina, cervix and uterus for lacerations.
 - Explore the uterine cavity for retained placental fragments.
 - Repair of the trauma
 - If there is a cervical tear, repair as follows:
 - Gently grasp the cervix with ring or sponge forceps.
 - Close the cervical tears with continuous size No.0 polyglycolic suture
 - Starting at the apex (upper edge of the tear).
 - If the cervical tear has extended deep beyond the vaginal vault (incomplete uterine rupture), a laparotomy may be required.
- iii. If PPH due to DIC:
 - Fresh frozen plasma, fresh blood transfusion, cryoprecipitate and fibrinogen.

Treatment of atonic PPH

1. Uterine massage and bimanual uterine compression.
2. Ensure bladder is empty.
3. Ecbolics must be given with uterine massage. These includes :
 - o Syntocinon by slow IV injection or IV infusion.
 - o Ergometrine by slow IV or IM.
 - o Carboprost (synthetic prostaglandin analogue of PGF2 alpha).
 - o Misoprostol 1000 microgram rectally.
4. Bimanual compression of the uterus



Bimanual compression

- Place the fist into the anterior fornix and apply pressure against the anterior wall of the uterus.
- With the other hand, press deeply into the abdomen behind the uterus, applying pressure against the posterior wall of the uterus.
- Maintain compression until bleeding is controlled and the uterus contracts. If failed do
- 5. Uterine tamponade: Uterine packing (balloon tamponade) e.g.
 - o Foley catheter procedure.
 - o Sengstaken-Blakemore tube.



Uterine tamponade

- 6. Laparotomy**
- comparison suture
 - B- Lynch
 - Vertical comparison sutures
 - Horizontal comparison sutures
- b) Derascularis ligation:
- Bilateral uterix artery ligation
 - Bilateral ligation of anterior division of internal iliac artery*
- C) Subtotal hysterectomy (of previous methods fail).



(B-Lynch suture) technique

*Do not waste valuable time trying to save the uterus at the expense of the general condition of the mother.

Secondary PPH

Causes:

- Uterine subinvolution
- Retained fragments
- Endometritis
- Placental polyp
- Choriocarcinoma

Investigations:

- High and low vaginal swabs
- Blood cultures if patient is pyrexial.
- Full blood count, C reactive protein
- Pelvic ultrasound may help to exclude the presence of retained products of conception.
- HCG titer to exclude choriocarcinoma.

Management:

- Treat the cause
- Administer IV broad spectrum antibiotics: Combination of ampicillin and metronidazole is appropriate.
- Give ecbolic drugs
- Surgical measures should be undertaken if there is excessive bleeding.

Retained placenta

Definition: Failure of placental delivery within 30 minutes after delivery of the fetus.

Incidence: 1%.

Causes:

1) Retained separated placenta due to:

- Atony of the uterus
- Constriction ring
- Rupture uterus: where the placenta passes to the peritoneal cavity.

2) Retained non-separated placenta due to:

- Atony of the uterus
- Abnormal adherence of the placenta which may be
 - Simple adhesion: Manual separation can be done easily.
 - Morbid adhesion: Placenta accreta, increta, percreta



Placenta percreta

Clinical picture:

- Bleeding: occurs only if the placenta is separated partially or completely
- Uterus: is lax in case of atony.
- Vaginal examination may reveal
 - Constriction ring
 - Rupture uterus
 - Morbid placental adherence where there is no plane of cleavage

Management:

(1) Uterine atony:

- Evacuation of the urinary bladder, ergometrine and massage the uterus if failed —
- Brandt-Andrews maneuver if failed —
- Manual separation of the placenta.

Manual removal of the placenta:

- The procedure is done under general anesthesia.
- The right hand is introduced along the umbilical cord into the uterus.
- The lower edge of the placenta is identified and by a sawing movement from side to side the placenta is separated from its bed.
- Grasp the placenta and deliver it out.
- Examine the placenta and membranes for *Manual removal of the placenta* completeness.
- The left hand is supporting the uterus abdominally throughout the procedure.



Complications:

- Perforation of the uterus
- Retained parts and Infection.

(II) Constriction ring:

- Deep anesthesia and amyl nitrite inhalation are given before manual separation of the placenta.

(III) Morbid adherence of the placenta:

- Simple adhesion and partial placenta previa: Manual separation is usually successful.
- Complete accreta. Hysterectomy is the treatment.
- If the patient is young and in need of more children, the umbilical cord is cut short and placenta is left in situ to undergo autolysis.
- Antibiotics to guard against infection.

(IV) In case of ruptured uterus: Manage as in ruptured uterus.

Complications of retained placenta:

- Shock
- Postpartum hemorrhage
- Puerperal sepsis
- Subinvolution
- Complications of the methods used for its separation.

Acute inversion of the uterus

Definition: The body of the uterus is partially or completely turned inside out.

Incidence: very rare about 1 : 20,000 deliveries.

Etiology:

1) Spontaneous inversion caused by:

- Precipitate labor
- Traction on a short cord by the fetus

- Straining or coughing while the uterus is lax, if the cervix is tone or gaped
- Submucus fundal myoma.

2) Iatrogenic inversion caused by:

- Pressure on the fundus or.
- Traction on the cord while the uterus is lax.

Degrees:

- First degree: The fundus is just depressed.
- Second degree: The inverted fundus protrudes through the cervix.
- Third degree: The whole uterus, including the cervix, is inverted and may drag the vagina and appear outside the vulva.



Clinical picture:

Symptoms:

- Pain in the lower abdomen.
- Sensation of vaginal fullness with a desire to bear down after delivery of the placenta.
- Vaginal bleeding: unless the placenta is not separated.

General examination:

- Shock is out of proportion to the amount of blood loss as it is more neurogenic due to traction on the peritoneum.

Abdominal examination:

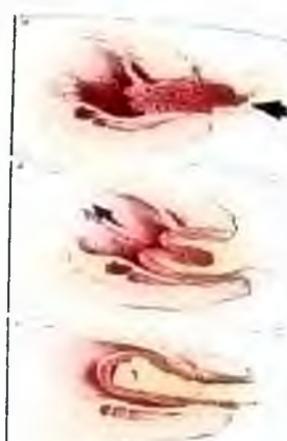
- Cupping of the fundus _____ in the 1st and 2nd degrees.
- Absence of the uterus _____ in the 3rd degree.

Vaginal examination:

- In the 2nd and 3rd degrees the inverted uterus appears as a soft purple mass in the vagina or at the vulva.

Management:

- Anti-shock measures
- Maternal reduction:
 - The inverted uterus is reduced manually under general anesthesia (preferably halothane to relax the uterus) using the palm of the hand or by hydrostatic pressure.
 - Tocolytics can be used to relax the uterus to facilitate reposition e.g. terbutaline.
 - If the placenta is still attached it is removed after successful reduction.
 - Massage the uterus and give ergometrine, IV oxytocin drip and antibiotics while maintaining the uterus in position till it contracts.
- Surgical reduction:
 - It is indicated in subacute and chronic inversions.
 - The cervix is incised posteriorly or anteriorly either vaginally or abdominally to correct the inversion.



Maternal obstetric injuries

LEARNING OBJECTIVES:

- To mention the sites of genital injury in labor.
- To define rupture uterus, describe its types and enumerate its causes in pregnancy and labor
- To mention the different types of rupture uterus.
- To describe clinical picture and management of rupture uterus.
- To describe the causes, types, complications, and methods of repair of cervical tear.
- To enumerate types of vaginal lacerations, methods of repair and complications of their repair.
- To describe the causes, types and management of shock in obstetric practice

These include:

- Rupture of the uterus
- Cervical tears
- Vaginal tears
- Hematoma of the vulva
- Perineal tears
- Trauma to the pelvic joints and nerves

Rupture of the uterus



Uterine rupture

Definition:

- Uterine rupture is defined as the loss of continuity of the uterine wall.
- It is the most serious obstetric accident during pregnancy and labor.
- It is one of the most important causes of maternal mortality.

Etiology:

- **A. During pregnancy**
- **1-Spontaneous**
- Rupture uterine scar.
 - CS (especially upper segment)
 - Previous repair of rupture uterus.
 - Myomectomy
 - Previous perforation during curettage.

Predisposing factors:

- Badly repaired incision
- Imperfect sutures with faulty cooptation
- Infected scar
- Eroded scar e.g. placenta previa
- Over stretched scar e.g. twin
- Repeatedly stretched scar e.g. VBAC
- Severe concealed accidental hemorrhage
- Sacculation:
 - Anterior: incarcerated retroverted gravid uterus.
 - Posterior: previous ventrofixation

2-Traumatic:

- ECV
- External trauma to abdomen
- During curettage

B. During labor:

1-Spontaneous:

- Obstructed labor: rupture LUS.
- Rupture uterine scar.
- Grand multipara: due to malpresentation and weak uterine muscles

2-Traumatic:(interference late in labor with over distended LUS and drained liquor)

- Version: Internal podalic version and bipolar version.
- Manual removal of placenta.
- Destructive operations.
- Forceps or breech extraction with incompletely dilated cervix

Types:

- **Complete:** all layers including peritoneum.
- **Incomplete:** rupture does not involve peritoneum.

Predisposing factors for uterine rupture

- Grand multiparity
- Fetal problems: macrosomia, malpresentation, malposition or anomalies
- Cephalopelvic disproportion

The most important are:

- Misuse of oxytocin and other ecbolics
- A high presenting part
- Previous CS

Clinically:

- 1-Impending rupture of the uterus (obstructed labor)
- 2-Dehiscence or rupture of a uterine scar
- 3-Actual rupture of the uterus

Dehiscence of a uterine scar

History;

The following conditions should raise the possibility of a scar dehiscence:

- History of previous CS, or myomectomy.
- Patient starts to complain of a painful scar.
- History of vaginal bleeding.

Examination

General examination

- Usually the patient is stable.

Abdominal examination

- Over distended uterus
- Tenderness over the scar

Local examination:

- Bleeding may be present.
- Pelvic ultrasound: Can detect the dehiscence and measure the uterine scar thickness.

Actual rupture of the uterus

i. Before delivery of the fetus

The patient has strong and frequent labor pains suddenly feels something "giving way," followed by the cessation of labor pains, then vaginal bleeding, constant abdominal pain, and collapse.

General examination

- Maternal tachycardia and hypotension
- Shock manifested early by dizziness, weakness or sweating or manifested late by restlessness, pallor, shortness of breath and/or collapse.

Abdominal examination

- Cessation of uterine contractions
- Alteration in the shape of the abdomen

- Fetal parts that are easily felt under the skin
- FHS usually cannot be heard.

Local examination will reveal:

- The presenting part of the fetus receding upward in station.
- Vaginal bleeding.
- ii. After delivery of the fetus
- The patient has severe vaginal bleeding, dizziness and collapse.

Preventive measures

During pregnancy

- Good antenatal care: assessment capacity of the pelvis,
- Presentation, position, and size of the fetus
- Hospital delivery for a patient with previous CS

During labor

- Labor monitored using the partograph.
- Crossing the Alert Line indicates the need for assessment by a senior obstetrician.
- Oxytocin should not be used to augment labor except after careful assessment.
- Avoid fundal pressure to force delivery.

Management

1) First aid management

- Insert two wide bore IV cannulae (size 16 or 18),
- Administer an IV crystalloid solution (saline or Ringer's lactate) at a fast drip (1 L/hour).
- Cross match two units of whole blood.
- Provide 100% oxygen via mask and warm the patient.
- Continuously monitor pulse and blood pressure every five minutes.
- Insert a Foley catheter and monitor urine output.

2) Active management

- Management of dehiscence of a uterine scar
 - Once the diagnosis has been made, a cesarean delivery should be performed.
- Management of an impending uterine rupture
 - CS is safer for the mother regardless of the fetal condition
- Management of an actual uterine rupture
 - If the uterus can be repaired, and the edges of the tear are repaired
 - If the rupture is too extensive for repair, proceed with a hysterectomy.
 - If the tear extends through the cervix and vagina, a total hysterectomy may be required

Cervical lacerations

Etiology:

- Forceps, ventouse or breech extraction before full cervical dilatation
- Manual dilatation of the cervix
- Improper use of oxytocin
- Precipitate labor.

Predisposing factors:

- Cervical rigidity
- Scarring of the cervix
- Edema as in prolonged labor
- Placenta previa due to increased vascularity.

Types:

- Unilateral : more common on the left side due to:
 - Dextro-rotation of the uterus
 - Left occipito-anterior position is the commonest
- Lateral
- Annular detachment
- Stellate: multiple tears extending radially from the external os like a star.



Diagnosis:

- Postpartum hemorrhage, in spite of well contracted uterus.
- Vaginal examination: The tear can be felt.
- Speculum examination:

Using a posterior wall self-retaining speculum or vaginal retractors and 2 ring forceps to grasp the anterior and posterior lips of the cervix, the tear can be visualized.

Complications:

- Postpartum hemorrhage.
- Rupture uterus due to upward extension.
- Infection: cervicitis and parametritis.
- Cervical incompetence leading to future recurrent abortion or preterm labor.

Management:

- Immediate repair: is carried out under general anesthesia with good light exposure.
- An assistant applies downward pressure on the uterus while the operator is grasping the anterior and posterior lips in a downward direction.
- Interrupted dixon or vicryl sutures are taken starting from above the apex of the tear to control bleeding from the retracted blood vessels.



Vaginal lacerations

Primary lacerations:

- Less common
- Caused by:
 - Forceps application
 - Vacuum extraction if the cup sucks a part from the vaginal wall.

Secondary lacerations:

- More common
- Caused by extension from perineal or cervical tears

Management:

- Immediate repair: Continuous locked sutures are taken starting from above the apex to control bleeding from the retracted blood vessels.
- Tight pack: may be needed to control bleeding from a raw surface area.
- Foley's catheter should be inserted before packing and both are removed after 12-24 hours.

Hematoma of the genital tract

1) Vulval (Infra-Levator) hematoma:

Causes: Traumatic due to:

- Incomplete hemostasis during repair of episiotomy or tear
- Direct trauma as kick or falling down
- Spontaneous: due to rupture of a varicose vein.



Clinical picture:

- The hematoma usually appears 12-48 hours after delivery.
- There is a painful tender tense bluish swelling at the vulva.
- The vulval swelling may be progressively enlarged.
- Manifestations of hypovolemia (e.g. hypotension and rapid pulse) and anemia may be present.



Management:

Small not-increasing hematoma:

- Conservative management as it usually resolves spontaneously.
- Prophylactic antibiotic may be given to guard against secondary infection.



Large increasing hematoma:

- Incised longitudinally
- Evacuation of the clotted blood
- Bleeding points are ligated.

2) Vaginal (Supra-Levator) hematoma:

Causes: Deep vaginal lacerations

Clinical picture:

- The blood is collected paravaginally above the levator ani muscle
- It may not be painful until reaching a large size.
- Manifestations of hypovolemia and anemia may be present.

Management: As vulval hematoma.

3) Broad ligament (Retroperitoneal) hematoma:

Causes:

- Upper vaginal, cervical or uterine tears which usually involve the vaginal or uterine artery.

Clinical picture:

- Hypovolemia, anemia or shock: are usually present
- Swelling on one side of the uterus which is:
 - a) Increasing over a period of hours or days and
 - b) May reach up to the lower pole of the kidney or even the diaphragm.
- The uterus is felt separate and deviated to the opposite side.
- Fever, ileus and unilateral leg edema: may develop later.

Management

- Small not-increasing hematoma: is managed conservatively as vulval hematoma.
- Large increasing hematoma:
 - Laparotomy, incision in the anterior leaflet of the broad ligament.
 - Evacuation of the blood clots.
 - Securing hemostasis, bilateral internal artery ligation or hysterectomy may be indicated.

Perineal lacerations

Etiology:

- 1) Lack of perineal elasticity:
 - Elderly primigravida.
 - Excessive scarring from a previous operation as posterior colpopерineorrhaphy.
 - Friability due to perineal edema.
- 2) Marked perineal stretch:
 - Head extension before crowning.
 - Macrosomic baby.
 - Face to pubis delivery.
 - Forceps delivery.
 - Narrow subpubic angle pushing the head backward.
- 3) Rapid perineal stretch:
 - Precipitate labor.
 - Rapid delivery of the after-coming head in breech presentation.

Degrees:

1) First degree:

Injury involves the perineal skin, fourchette and the posterior vaginal wall.

2) Second degree:

Injury involves the muscles of the perineal body but not the external anal sphincter.

3) Third degree:

Injury involves the anal sphincter complex.

a) 3a: less than 50 % of external anal sphincter thickness torn.

b) 3b: more than 50 % of external anal sphincter thickness torn.

c) 3c: Both external and internal anal sphincter torn.

4) Fourth degree:

Injury involves the anal sphincter complex (EAS & IAS) and anal epithelium.



First degree



Second degree



Third degree



Fourth degree

Types:

- Incomplete perineal tear = 1st or 2nd degrees.
- Complete perineal tear = 3rd or 4th degrees.
- Hidden perineal tear: The levator ani muscle is torn without apparent perineal tear predisposing to future prolapse.

Complications:

- Postpartum hemorrhage
- Puerperal infection
- Incontinence of stool and flatus in unrepairs or imperfectly repaired 3rd or 4th degree tear
- Future genital prolapse.

Prevention:

- Proper management of second stage of labor
- Episiotomy in the proper time.

Treatment:

Any perineal tear should be repaired within 24 hours, under local infiltration, general or regional anesthesia.

Repair:

- 1st degree:
Vagina and skin are sutured as in an episiotomy repair.
- 2nd degree:
The following layers are repaired
 - Vaginal wall (continuous sutures from above downwards).
 - Levator ani muscles.
 - Perineal muscles.
 - Perineal skin.
- 3rd degree
 - Cut ends of the anal sphincter are identified and sutured.
 - Repair of EAS overlapping or end to end method can be used.
 - Then layers repair as above.
- 4th degree
 - Rectal wall is sutured in 2 layers.
 - 1st continuous and 2nd interrupted sutures not going through rectal mucosa.
 - Then as 3rd degree repair.

Suture materials:

Either monofilament sutures such as PDS or Vicryl can be used with equivalent outcome.

Post-operative care of complete perineal tear:

- Prevent reactionary hemorrhage: vaginal pack and catheter for 24 hours.
- The perineal wound is kept clean and sterile by using antiseptic solution after each micturition or defecation.
- Reduce the incidence of post-operative infections and wound dehiscence:
 - NPO & IV fluids for 2 days.
 - Low residue diet

- Laxatives: stool softeners and bulking agent.
- Oral intestinal antiseptics
- On fifth day the patient is given oral purgative solutions to lubricate the stool.
- Broad spectrum antibiotics.
- Pelvic floor exercises: for 6-12 weeks after repair.

Shock in obstetrics

Definition:

Inadequate perfusion (blood flow) leading to inadequate oxygen delivery to tissues

Types of shock

1. Hypovolemic shock
2. Cardiogenic shock
3. Neurogenic shock
4. Anaphylactic shock
5. Septic shock

Hypovolemic shock

Causes:

- Blood loss (obstetric hemorrhage)
 - Bleeding in early pregnancy
 - Antepartum hemorrhage
 - Postpartum hemorrhage.
- Fluid loss e.g.
 - Hyperemesis gravidarum, diarrhea and keto-acidosis.
- Plasma loss e.g.
 - Severe burns, supine hypotension syndrome.
 - Sudden drop in intrauterine pressure e.g. Hydramnios
 - The most common form of hypovolemic shock in obstetrics is hemorrhagic shock due to massive obstetric hemorrhage

Obstetrical hemorrhage

Definition:

Blood loss associated with pregnancy or parturition that

- Causes maternal or perinatal death.
- Requires blood transfusion,
- Decreases Hct by 10 points OR
- Triggers emergency therapeutic response.

Stages of shock:

1) Compensated shock

- Defense mechanisms are successful in maintaining perfusion
- Presentation: Tachycardia, decreased skin perfusion and altered mental status

2) Uncompensated shock

- Defense mechanisms begin to fail
- Presentation: Hypotension, marked increase in heart rate, rapid thready pulse, agitation, restlessness and confusion

3) Irreversible shock

- Complete failure of compensatory mechanisms
- Marked loss of tissue perfusion cause cell damage and death even in presence of resuscitation

Diagnosis

Signs and symptoms

- Hypotension, rapid weak pulse, pallor and sweating.
- Cold extremities.
- Oliguria or anuria.
- Confusion.

Management

1) Initial treatment

2) Maintain airway

- Apply high concentration oxygen.
- Assist ventilations as needed.
- Place patient in the Trendelenburg position.
- Control obvious bleeding.
- Prevent loss of body heat.

3) Restoration of circulation

- Insert at least two large bore IV catheters.
 - Crystalloids for initial resuscitation.
 - Rapidly infuse 5% dextrose in lactated Ringer's solution while blood products are obtained.
 - Colloids/packed RBC's to replace blood loss.
- #### **4) Blood**
- Order at least 6 units of red cells.
 - Do not insist on cross matched blood if transfusion is urgently needed.
 - Apply compression cuff to infusion pack.
 - Monitor central venous pressure (CVP) and arterial pressure.

Complications of hypovolemic shock

- Acute renal failure.
- Pituitary necrosis (Sheehan's syndrome).
- Disseminated intravascular coagulation.

Neurogenic shock

Abnormal vessel tone due to trauma and tissue damage as in painful conditions

Obstetric causes of neurogenic shock

- Disturbed ectopic pregnancy.
- Concealed accidental hemorrhage.
- Manual removal of placenta without anesthesia.
- Difficult forceps or breech extraction.

Clinical picture

- Patient is quiet, apathetic, irritable, and anxious with air hunger.
- No hemorrhage External or internal hemorrhage.
- Superficial veins are full.
- Peripheral collapse.

Septic shock

Results from body's response to bacteria in blood stream, vessels dilate and become "leaky"

Risk factors:

- Obesity
- Impaired glucose tolerance / diabetes
- Impaired immunity/ immunosuppressant medication
- Anemia
- History of pelvic infection
- History of group B streptococcal infection
- Amniocentesis and other invasive procedures
- Cervical cerclage
- Prolonged spontaneous rupture of membranes
- GAS infection in close contacts / family members

Obstetric causes of septic shock

- Septic abortion (usually illegal).
- Acute pyelonephritis.
- Chorioamnionitis.
- Retained placental tissue.
- Puerperal sepsis
- Postoperative infections.

Diagnosis

Recognition of septic shock

- Early – warm shock – similar to neurogenic shock
- Late – Cold shock – similar to cardiogenic shock

Clinical features suggestive of sepsis

- Fever or rigors
- Diarrhea or vomiting - may indicate exotoxin production (early toxic shock)
- Rash (generalized streptococcal maculopapular rash or purpura fulminans)
- Abdominal / pelvic pain and tenderness
- Offensive vaginal discharge (smelly suggests anaerobes; serosanguinous suggests streptococcal infection)
- Productive cough
- Urinary symptoms

Investigations:

- Obtain blood cultures prior to antibiotic administration.
- Measure serum lactate (Serum lactate ≥ 4 mmol/l is indicative of tissue hypoperfusion).
- According to suspected source of infection e.g. urine analysis, C&S, vaginal discharge swab C&S, imaging (ultrasound chest X-ray).
- KFT, LFT and coagulation profile.

Management:

- Continuous monitoring of vital signs and urine output (ICU admission)
- Resuscitation by IV fluids and oxygen
- Eradication of source of infection
 - Administration of intravenous broad spectrum antibiotics
 - Suction evacuation or even hysterectomy in case of septic abortion or infected retained placental tissues.

Cardiogenic shock

Shock due to pump failure or malfunction (decreased contractility)

Obstetric causes of cardiogenic shock:

- Causes of hypovolemic shock.
- Coronary spasm.
- Cardiomyopathy.
- Pulmonary embolism.
- Amniotic fluid embolism.
- Mendelson's syndrome.

Clinical picture

Symptoms:

- Tachycardia, tachypnea and respiratory distress
- Mental status change
- Cool extremities
- Poor perfusion signs of dehydration

Amniotic fluid embolism

Definition:

A rare obstetric emergency in which amniotic fluid, fetal cells, hair, or other debris enter the maternal circulation, causing cardiorespiratory collapse.

Pathophysiology

- The first phase is similar to pulmonary embolism.
- If the woman survives this phase, she enters a hemorrhagic phase characterized by massive hemorrhage with uterine atony and DIC.

Predisposing factors:

- Hyper stimulation of the uterus (abuse of oxytocin)
- Strong contractions and intact membrane or ruptured membrane but deeply engaged presenting part → open vein

Diagnosis:

History

- Usually occurs during labor but may be during abortion
- Acute onset of dyspnea, cyanosis, seizures and Peripartum sudden collapse
- Massive hemorrhage
- Cardiac arrest and death usually within an hour of onset

General examination:

- Hypotension with loss of diastolic measurement
- Tachypnea
- Tachycardia
- Cyanosis
- Heart and chest examination may show pulmonary edema advancing to cardiac arrest

Abdominal examination:

- There is uterine atony with excessive bleeding after delivery.

Investigations

- ABG: hypoxia/hypoxemia
- CBC
- PT is prolonged because clotting factors are used up.
- Chest x-ray evidence of pulmonary edema

Treatment

Prophylaxis

- Avoid uterine hyperstimulation.
- Avoid augmentation before ROM.

Active management

- Insert a wide bore IV cannula.
- Administer oxygen to maintain normal saturation.
- CPR if the patient arrested.
- Treat hypotension with crystalloids and blood products or vasopressors
- Closely monitor the fetus.
- Treat coagulopathy with FFP for a prolonged PT > 1.5 times the control value
- Cryoprecipitate for a fibrinogen level < 100 mg/dL.
- Transfuse platelets for a platelet count < 20,000/mm³.

A quick cesarean delivery may be performed in arrested mothers who are unresponsive to resuscitation if the fetus is still living.

Maternal mortality

Definition:

Death of a woman while pregnant or within 42 days after delivery from any cause related to or aggravated by pregnancy or its management.

Types:

1) Direct obstetric deaths

Result from obstetric complications of pregnancy, labor or the postpartum period as well as their management.

2) Indirect obstetric deaths

Result from previously existing diseases or diseases arising during pregnancy which are aggravated by the physiological effects of pregnancy e.g. CVS diseases, anemia.

3) Incidental

Any cause unrelated to pregnancy: car accident ...etc.

Measures:

▪ Maternal mortality ratio:

Number of maternal deaths during a given year per 100 000 Live births during the same period of time

▪ Maternal mortality rate:

Number of maternal deaths in a given year per 100 000 Women of reproductive age (15-49 years) in the same year

▪ Lifetime risk of maternal death:

The maternal mortality rate multiplied by the length of the reproductive period

Maternal mortality in Egypt

Maternal mortality rate:

- 174/ 100.000 in 1991
- 84/100.000 in 2000

Causes:

- Hemorrhage: (25% of causes)
- Especially postpartum hemorrhage unpredictable, sudden in onset, and more dangerous when a woman is anemic.
- Sepsis: (15% of causes) Due to poor hygiene during delivery or of untreated STDs.
- Hypertensive disorders of pregnancy: (12% of causes)
- Complications of unsafe abortion: (13% of causes)
- Prolonged or obstructed labor: (8% of causes)
- Indirect deaths: (20% of causes)

How to reduce maternal mortality in Egypt?

By proper antenatal, intranatal and postpartum care

Obstructed labor

LEARNING OBJECTIVES:

- To define obstructed labor, enumerate its causes, and describe its clinical picture
- To describe the signs of impending rupture uterus
- To list the line of management in early and late cases
- To be able to feel contractions with obstruction plus Bondi's ring

Definition: Arrest of vaginal delivery of the fetus due to mechanical obstruction

Etiology:

I. Maternal causes:

(I) Bony obstruction: e.g.

- Contracted pelvis.
- Tumors of pelvic bones.

(II) Soft tissue obstruction:

- Uterus:
 - Impacted subserous pedunculated fibroid.
 - Constriction ring opposite the neck of the fetus
- Cervix:
 - Cervical dystocia
- Vagina:
 - Septa, stenosis and tumors
- Ovaries:
 - Impacted ovarian tumors

(III) Fetal causes:

- Malpresentation and malposition's: e.g.
 - Persistent occipito-posterior and deep transverse arrest.
 - Persistent mento-posterior and transverse arrest of the face presentation
 - Brow, shoulder and impacted frank breech.
- Large sized fetus (macrosomia).
- Congenital anomalies . e.g.
 - Hydrocephalus
 - Fetal ascitis
- Fetal tumors.
- Locked and conjoined twins.

Diagnosis:

It is the clinical picture of obstructed labor with *impending rupture uterus* (excessive uterine contraction and retraction).

History of:

- Prolonged labor,
- Frequent and strong uterine contractions,
- Rupture membranes.

General examination:

Shows signs of maternal distress as:

- Exhaustion,
- High temperature (38°C), rapid pulse, signs of dehydration, dry tongue and cracked lips.

Abdominal examination:

The uterus:

- Hard and tender,
- Frequent strong uterine contractions with no relaxation in between (tetanic contractions).
- **Rising retraction ring** is seen and felt as an oblique groove across the abdomen.



The fetus:

- Fetal parts cannot be felt easily.
- FHS are absent or show fetal distress due to interference with the utero-placental blood flow.

Vaginal examination:

- Vulva: is edematous.
- Vagina: is dry and hot.
- Cervix: is fully or partially dilated, edematous and hanging.
- The membranes: are ruptured.
- The presenting part: is high and not engaged or impacted in the pelvis. If it is the head it shows excessive moulding and large caput.
- The cause of obstruction can be detected.

Differential diagnosis:

- Constriction ring
- Full bladder
- Fundal myoma.

Complications:

(I) Maternal:

- Maternal distress and ketoacidosis
- Rupture uterus
- Necrotic vesico -vaginal fistula
- Infections as chorioamnionitis and puerperal sepsis.
- Postpartum hemorrhage due to injuries or uterine atony.

(II) Fetal:

- Asphyxia.
- Intracranial hemorrhage from excessive moulding
- Birth injuries
- Infections.

Management:

(A) Preventive measures:

- Careful observation and proper assessment
- Early detection and management of the causes of obstruction.

(B) Curative measures:

- Cesarean section is the safest method even if the baby is dead
- Labor must be immediately terminated and any manipulations may lead to rupture uterus

Shoulder dystocia

Definition: It is a difficulty in shoulder delivery after delivery of the head for ≥ 60 seconds

Incidence: about 0.5% of deliveries.

Causes:

Large shoulders which may be due to :

- Maternal obesity.
- Diabetic mothers.
- Post-term pregnancy.
- Anencephaly.
- Failure of shoulder rotation.
- Contracted and pelvis.



Prediction:

- Presence of risk factors of macrosomia (see later).
- Ultrasonographic assessment of fetal weight.

Clinical Picture:

- The head is delivered and the chin is applied firmly against the perineum.
- There is no further progress in spite of gentle traction on the head for ≥ 60 .

Management:

Prophylaxis:

- Proper antenatal care particularly for high risk mothers as diabetics.
- Antepartum assessment of fetal weight (macrosomic babies should be delivered by cesarean section).

Management of shoulder dystocia:

- Calling urgently an anesthetist and pediatrician.

1. Simple measures (1st line) :

The following methods are used in a rapid succession when the previous one fail.

I-Mc Roberts' maneuver:

It is sharp flexion of the maternal thighs against her abdomen.

This can free the shoulders by:

- Backward displacement of the sacral promontory.
- Upward displacement of the symphysis pubis.
- Decrease the inclination of the pelvic inlet.
- Decrease in lumbar lordosis.

2-Gentle downward traction + suprapubic pressure by an assistant obliquely to flex the anterior shoulder against the fetal chest.

Mc Robert's maneuver

Advanced measures(2nd line):

I-Rubin's manoeuvre (Rotation of the anterior shoulder-if un-rotated) by fingers transvaginally to bring it in the antero - posterior diameter



2-Woods screw maneuver:

- Rotate the fetus as a screw between the resisted promontory and symphysis.
- Two fingers of the right hand is pressing from the posterior aspect of the posterior shoulder to rotate it 180° anteriorly where it escapes from below the symphysis

- The left hand is placed on the mother's abdomen and assists this rotation by pressing on the fetal buttock in the same direction of rotation.

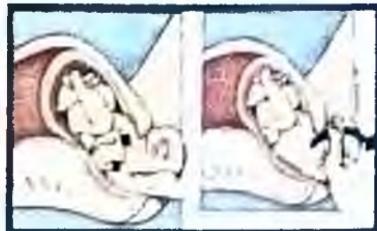
3-Extraction of the posterior arm:

- Pressing with 2 fingers against the cubital fossa to sweep the posterior arm in front of the chest and deliver it giving space for the anterior shoulder to escape from below the symphysis.
- This is aided by suprapubic pressure

2. Heroic measures (3rd line) :

Zavanelli maneuver (cephalic replacement):

- Prepare for cesarean section.
- Subcutaneous terbutaline (tocolytic) is given to relax the uterus
- Rotate the head manually to the antero-posterior diameter
- Flex the head and press on it firmly and constantly to replace it intravaginally where it is supported by an assistant.
- Immediate caesarean section is performed



Clavicular fracture:

- Reduce the diameter of the shoulders.
- It is done by upward pressure against its midportion to avoid injury of the subclavian vessels.

Complications:

Fetal:

- Asphyxia and death
- Brachial plexus injury causing Erb's palsy
- Fracture clavicle or humerus.

Maternal:

- Injuries from maneuvers which may extend up to rupture uterus.



Erb's palsy

Abnormal uterine action

LEARNING OBJECTIVES:

- To define abnormal uterine action.
- To describe the different clinical varieties of abnormal uterine action including hypotonic and hypertonic inertia, precipitate labor, pathological retraction ring and cervical dystocia.
- To list the causes and risks of each type and method of treatment.
- To describe how to feel and count normal and abnormal uterine contractions.

Classification:

1- Over-efficient uterine action:

- Precipitate labor: in absence of obstruction.
- Excessive contraction and retraction: in presence of obstruction.

2- Inefficient uterine action:

- Hypotonic inertia.
- Hypertonic inertia (uncoordinated uterine action):
 - Colicky uterus.
 - Constriction (contraction) ring.
 - Cervical dystocia.

Precipitate labor

Definition: A labor lasting less than 3 hours.

Etiology:

It is more common in multiparas due to:

- Strong uterine contractions
- Small sized baby
- Roomy pelvis
- Minimal soft tissue resistance.

Complications:

Maternal:

- Lacerations of the cervix, vagina and perineum
- Shock
- Inversion of the uterus
- Postpartum hemorrhage
- Sepsis due to: lacerations and inappropriate surroundings.

Fetal:

- Intracranial hemorrhage due to sudden compression and decompression of the head
- Fetal asphyxia due to strong frequent uterine contractions reducing placental perfusion
- Avulsion of the umbilical cord.
- Fetal injury due to falling down.

Management:

Before delivery:

Patient who had previous precipitate labor should be hospitalized before expected date of delivery as she is more prone to repeated precipitate labor

During delivery:

- Inhalation anesthesia: as nitrous oxide and oxygen is given to slow the course of labor
- Tocolytic agents as Ritodrine (Yutopar) may be effective
- Episiotomy to avoid perineal lacerations and intracranial hemorrhage

After delivery:

- Examine the mother and fetus for injuries.

Excessive uterine contraction and retraction

Physiological retraction ring:

- It is a line of demarcation between the upper and lower uterine segment present during normal labor and cannot usually be felt abdominally

Pathological retraction ring (Bandl's ring):

- It is the rising up retraction ring during obstructed labor due to marked retraction and thickening of the upper uterine segment
- The relatively passive lower segment is markedly stretched and thinned to accommodate the fetus
- The Bandl's ring is seen and felt abdominally as a transverse groove that may rise to or above the umbilicus

Clinical picture: Is that of obstructed labor with impending rupture uterus

Management:

Obstructed labor should be properly treated otherwise the thinned lower uterine segment will rupture.

Hypotonic uterine inertia

Definition: The uterine contractions are infrequent, weak and of short duration.

Etiology:

(A) General factors:

- 1- Primigravida particularly elderly.
- 2- Anemia and asthenia.
- 3- Nervous and emotional as anxiety and fear.
- 4- Hormonal due to deficient prostaglandins or oxytocin as in induced labor.
- 5- Improper use of analgesics.

(B) Local factors:

- 1- Over distension of the uterus.
- 2- Developmental anomalies of the uterus e.g. hypoplasia.
- 3- Myomas of the uterus interfering mechanically with contractions.
- 4- Malpresentation, malposition and cephalopelvic disproportion.
- 5- Full bladder and rectum.

Types

- Primary inertia: weak uterine contractions from the start.
- Secondary inertia: inertia developed after a period of good uterine contractions

Clinical Picture:

- Labor is prolonged.
- Uterine contractions are infrequent, weak and of short duration.
- Slow cervical dilatation.
- Membranes are usually intact.
- The fetus and mother are usually not affected apart from maternal anxiety due to prolonged labor.
- More susceptibility for retained placenta and postpartum hemorrhage due to persistent inertia.

Management:

General measures:

- Examination to detect disproportion, malpresentation or malposition and manage according to the case.
- Proper management of the first stage (see normal labor).
- Prophylactic antibiotics in prolonged labor particularly if the membranes are ruptured.

Amniotomy

- If the cervix is more than 3 cm dilatation and the presenting part occupying well the lower uterine segment.

Oxytocin:

- 5 units of oxytocin (Syntocinon) in 500 ml. glucose 5% by IV infusion
- Start with 10 drops per minute and increasing gradually to get a uterine contraction rate of 3 per 10 minutes.

Operative delivery:

- Vaginal delivery: by forceps, vacuum or breech extraction according to the presenting part and its level providing that,
- Cesarean section:
- Indicated failure of the previous methods.

Hypertonic uterine inertia (Uncoordinated uterine action)

Types:

- Colicky uterus: incoordination of the different parts of the uterus in contractions.
- Hyperactive lower uterine segment: so the dominance of the upper segment is lost.

Clinical picture:

The condition is more common in primigravidae and characterized by:

- Labor is prolonged.
- Uterine contractions are irregular and more painful.
- The pain is felt before and throughout the contractions with marked low backache often in occipito-posterior position.
- High resting intrauterine pressure in between uterine (normal value is 5-10 mmHg).
- Slow cervical dilatation.
- Premature rupture of membranes.
- Fetal and maternal distress.

Management:

- General measures:
As hypotonic inertia
- Medical measures:
 - Analgesic and antispasmodic as Pethidine.
 - Epidural analgesia may be of good benefit.
- Cesarean section if:
 - Failure of the previous methods.
 - Disproportion.
 - Fetal distress before full cervical dilatation.

Constriction (contraction) ring

Definition: It is a persistent localized annular spasm of the circular uterine muscles.

- It occurs at any part of the uterus but usually at junction of the upper and lower uterine segments.
- It can occur at the 1st, 2nd or 3rd stage of labor.

Etiology: Unknown but the predisposing factors are:

- Malpresentation and malposition.
- Clumsy intrauterine manipulations under light anesthesia.
- Improper use of oxytocin.

Diagnosis:

- The condition is more common in primigravidae and frequently preceded by colicky uterus.
- The exact diagnosis is achieved only by feeling the ring with a hand introduced into the uterine cavity.

Complications:

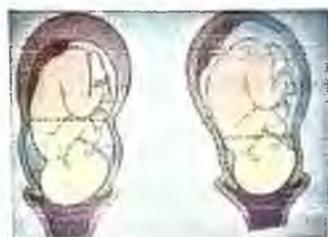
- Prolonged 1st stage: if the ring occurs at the level of the internal os.
- Prolonged 2nd stage: if the ring occurs around the fetal neck.
- Retained placenta and postpartum hemorrhage: if the ring occurs in the 3rd stage (hour-glass contraction).

Management: Exclude malpresentation, malposition and disproportion.

- In the 1st stage:
Pethidine may be of benefit.
- In the 2nd stage:
 - Deep general anesthesia and amyl nitrite inhalation to relax the constriction ring
 - If the ring is relaxed, the fetus is delivered immediately by forceps.
 - If the ring does not relax, cesarean section is carried out with lower segment vertical incision to divide the ring.
- In the 3rd stage:
Deep general anesthesia and amyl nitrite inhalation followed by manual removal of the placenta.



Retraction ring



Constrictive ring

	Pathological retraction ring	Constriction ring
Timing	Occurs in prolonged 2nd stage.	Occurs in the 1st, 2nd or 3rd stage.
Site	Always between upper and lower uterine segments.	At any level of the uterus.
	Rises up.	Does not change its position.
Diagnosis	Felt and seen abdominally.	Felt only vaginally.
	The uterus is tonically retracted, tender and the fetal parts cannot be felt.	The uterus is not tonically retracted and the fetal parts can be felt.
Complications	Maternal distress and fetal distress or death.	Maternal and fetal distress may not be present.
Management	Relieved only by delivery of the fetus.	May be relieved by anesthetics or antispasmodics.

Cervical dystocia

Definition: Failure of the cervix to dilate within a reasonable time in spite of good regular uterine contractions.

Types:

- 1) Organic (secondary) due to:
 - Cervical fibrosis after amputation, cone biopsy, extensive cauterization or obstetric trauma.
 - Organic lesions as cervical myoma or carcinoma.
- 2) Functional (primary):
 - Due to lack of softening of the cervix during pregnancy or cervical spasm resulted from overactive sympathetic tone.

Complications:

- Annular detachment of the cervix: bleeding from the cervix is minimal because of fibrosis
- Rupture uterus
- Postpartum hemorrhage

Management:

Organic dystocia:

- Cesarean section is the management of choice.

Functional dystocia:

- Pethidine and antispasmodics: may be effective.
- Caesarean section: if medical treatment fails or fetal distress developed.

Poor progress in labor

Partogram: is the graphical recording of observations done to a woman in labor for:

- 1) Progress of labor: cervical dilatation & descent of head overtime.
- 2) Maternal observations
- 3) Fetal observations

Partogram is the cornerstone in management of poor progress (see normal labor)

Disorders of latent phase

1. Prolonged latent phase:

Definition:

- o Latent phase > 95th percentile.
- o Friedman definition: > 20 hours in nullipara (> 14 hours in multipara)

Normally, during latent phase, there is change in cervical ground substance, glycoprotein, water content resulting in remodeling and effacement.

Management:

1. Personal support
2. Morphine 15-20 mg S.C or IM (therapeutic test) will alleviate pain and make patient resting till active phase starts.
3. Avoid oxytocin as it: will not ↑ vaginal delivery, 1C.S rate(10 folds)and poor APGAR score (3 folds)

2. Arrest of latent phase:

Labor did not begin truly.

Disorders of active phase

1) Protraction (try dysfunctional labor)

Definitions:

- o Cervical dilatation < 1 cm/hour for 4 hours
- o Friedman definition: < 1.2 cm/hour in nullipara and < 1.5 cm/hour in multipara

Causes:

1. Inadequate uterine activity (hypotonic inertia) is the commonest cause
2. Malposition
3. CPD

Complications:

1. May end in obstructed labor → rupture uterus
2. Maternal infections
3. PPH (Atony)
 - 2) Try arrest of cervical dilatation (try dysfunctional labor):

Definition:

Cessation of cervical dilatation > 2 hours following normal period of active phase

Causes:

The same causes as 1st dysfunctional labor, but commonly due to underlying pathological condition (CPD)

So, the usual management is C.S.

Disorders of 2nd stage:

1. Protraction disorder:

Definition: Descent < 1 cm/hour in nullipara and < 2 cm/hour in multipara

Causes:

1. Inadequate uterine activity \Rightarrow TTT: oxytocin = forceps and if failed \rightarrow C.S
2. Malposition
3. CPD \Rightarrow TTT: C.S
4. Loss of maternal explosive power (epidural anesthesia) \Rightarrow TTT: oxytocin = forceps

2. 2nd arrest of descent:

Definition: Failure of descent > 1 hour

Causes: The same as Protraction of descent. But CPD is the commonest cause

Management: is individualized. But C.S is the usual management (CPD)

Diagnosis

- Evaluate uterine activity:
 - Rough method: by palpation of uterine contractions abdominally
 - External tocodynamometer.
 - Internal manometer: the most accurate method for monitoring uterine action and oxytocin augmentation.
- Evaluate maternal explosive force. 2nd stage
- Exclude:
 - CPD: (clinical pelvimetry, evaluate fetal size and CPD test)
 - Malposition. \Rightarrow Manage accordingly.
- Exclude fetal distress:
 - Pitard stethoscope or sonicaid
 - External continuous HR monitoring (CTG)
 - Scalp electrode \rightarrow ECG (external)

Management

- Maternal hydration: important
- Provide:
 - One to one care
 - Continuous personal support
 \Rightarrow The most important in improvement of fetal & maternal outcome
- Mobilization: may constitute in progress of 1st stage
- Augmentation:

a) After exclusion of CPD and fetal distress

- o Amniotomy (ARM):

Early amniotomy in normal labor: does not ↓ duration of labor and ↑ C.S rate

It should be done for inefficient contractions

- Value of amniotomy:

1. ↑ PGs
2. Fergusson reflex
3. Allow examination of AF
4. Allow internal monitoring (manometry and scalp ECG)

- o Oxytocin:

Aim to provide contractions: 4-5 / 10 min & lasting > 40 seconds

↑ dose after 30 minutes to reach sufficient contractions (as it reaches steady level after 30-45 minutes)

If augmentation > 8 hours → successful V.D is unlikely

- i. RCOG: C.S should not be done in primigravida for poor progress EXCEPT after trial of oxytocin
- ii. It is not appropriate to wait for this long time, SO decision is taken earlier according to clinical situation

- o Instrumental delivery: for 2nd stage disorders due to malposition.

1. C.S: in

- 1 CPD
2. Malposition and malpresentation
3. Fetal distress
4. Failure of the above measures
5. Contraindications of oxytocin

Cephalopelvic disproportion

LEARNING OBJECTIVES:

- To define and describe the common types of contracted pelvis
- To list the diagnostic methods and describe the cephalo-pelvic disproportion (CPD) tests
- To mention the complications of CPD
- To describe the methods of delivery in cases of CPD.

Contracted pelvis

Anatomical definition:

A pelvis in which one or more of the pelvic diameters is reduced below the average by one or more centimeters



Obstetric definition:

A pelvis in which one or more of pelvic diameters is decreased enough to cause difficulty in vaginal delivery of average size baby (dystocia)

Etiology:

1) Congenital:

- Naegel's pelvis = asymmetric contracted pelvis due to absence of one ala of the sacrum
- Robert's pelvis: transversely contracted pelvis due to absence of 2 ala of the sacrum.
- High assimilation pelvis: the sacrum is made of 6 fused segments
- Low assimilation pelvis: the sacrum is made of 4 fused segments
- Split pelvis: absent pubic bone usually associated with ectopia vesica
- Dislocation of the hip joint

2) Acquired:

- Metabolic disease:
 - Rickets: flat rachitic pelvis
 - Generally contracted rachitic pelvis
 - Osteomalacia: causing triradiate pelvis
- Vertebral column disease:
 - Kyphosis
 - Scoliosis
 - Spondylolisthesis
- Lower limb disease:
 - Resulting in missing or shortening of one limb during childhood or adolescence before ossification of the pelvis

- Disease of the pelvic bones:
 - Fractures
 - Tumors of pelvic bones

Diagnosis of CP

1) History

- Past history of trauma or disease that cause pelvic contractions e.g. Rickets, ectromelia, poliomyelitis, TB fractures or orthopedic surgery
- Bad obstetric history, Malpresentation, repeated fetal losses and operative deliveries

2) Examination:

1- General:

- Short stature
- Rachitic manifestation
- Atypical gait (waddling)

2- Abdominal (during pregnancy)

- Pendulous abdomen
- Scar of CS
- Malpresentation face, brow, shoulder presentation
- Non engaged head in last 3-4w of pregnancy in primigravida

3) Investigations:

Clinical Pelvimetry:

Internal pelvimetry: (Usually done after 36 weeks)

- Diagonal conjugate: Tip of the middle finger reaching the sacral promontory. The true conjugate can be measured by subtracting 1.5 cm from it.
- The antero-posterior diameter of the pelvic outlet: as diagonal conjugate but tip of middle finger touches the tip of sacrum.
- Palpate the shape of the sacrum
- Palpate the ischial spines: not prominent+ distance between them >10.5cm
- Palpate the coccyx: normally is mobile and can recede backwards easily.
- Palpate side walls of the pelvis; normally parallel or divergent.
- Palpate sacrosciatic notch: wide

External pelvimetry of the outlet:

- Normally the subpubic angle can accommodate two fingers near the apex without any difficulty.
- Bituberous diameter (normally 11 Cm): - Normally can accommodate closed fist or the knuckles of the 4 fingers easily.
- Antero-posterior diameter of the outlet: normally 13cm and measured by 2 fingers in vagina.

Sonographic cephalometry:

- US to determine diameters of fetal head
- Radiological pelvimetry:
 - o Lateral view (the most important)
 - o Inlet view.
 - o Outlet view.

Degrees of contracted pelvis (radiological):

- 1) Minor degree
 - A-P diameter 9-10 cm.
 - No actual CPD (compensated by uterine contraction and pelvic reserve)
 - Vaginal delivery is the rule
- 2) Moderate degree
 - A-P diameter 8-9 cm
 - 1st degree CPD (Most cases of CP)
 - Trial labor: - If succeeded vaginal Delivery.
 - If failed =CS.
- 3) Major degree
 - A-P diameter 6-8 Cm
 - 2nd degree CPD
 - Living fetus do C.S
 - Dead. Craniotomy in the past
- 4) Extreme degree
 - A-P < 6 cm
 - C.S is done even dead fetus (A-P diameter < smallest diameter of head (Bimastoid))

Cephalopelvic disproportion

- (In non-cephalic presentation it is called feto-pelvic disproportion)
- Disproportion between the head in cephalic presentation and maternal pelvis



Causes:

- Decreased pelvic capacity.
- Excessive fetal size or abnormal fetal development.
- Combination of both (more common).

Degrees:

- 1) Minor degree (Minor disproportion)
 - The anterior surface of the head is in line with the posterior surface of the symphysis pubis.

- Vaginal delivery is the rule.
- 1) 1st degree CPD (Moderate disproportion)
 - The anterior surface of the head flush with the anterior surface of the symphysis pubis.
- Trial labor : If succeeded -Vaginal delivery
- If failed do CS.
- 2) 2nd degree CPD (Severe disproportion)
 - The head is projecting beyond (overriding) the anterior surface of the symphysis pubis.
- CS is the rule

Cephalopelvic disproportion (CPD) tests:

Indications: If the head is not engaged in the last 2 weeks of pregnancy

Idea: The fetal head is used as a pelvimeter (fetal head is the best pelvimeter).

1) Pinard's maneuver : (External method)

Position:

- Semi-sitting position to correct pelvic inclination (the axis of the fetus and the uterus becomes perpendicular to the brim).
- Left hand grasps the head and pushes it steadily in the pelvis.
- Right hand; 2 fingers are placed in front of symphysis pubis to determine engagement & degree of overlap of the head on the symphysis pubis.

2) Pinard's-Muller-Kerr's Bimanual Maneuver (External & Internal)

Position:

- Dorsal position with head & shoulder slightly raised - thigh flexed & abducted
- Left hand : as Pinard's maneuver
- Right hand: Index & middle fingers inside the vagina to assess the degree of descent of fetal head in relation to ischial spine the angle between the head and posterior surface of symphysis pubis.
- Thumb is placed on the symphysis to note any overlap of the head over it.

Results:

Head enters the pelvis → no CPD → vaginal delivery is the rule

Inability to push the head into the pelvis → doesn't necessarily indicate that vaginal delivery is impossible.

If the flexed head overrides symphysis pubis → disproportion.

Management:

According to the degree of CPD:

- Minor disproportion: vaginal delivery is the rule.
- Moderate degree: trial labor if suitable.
- Severe degree: CS is the rule

Trial of labor

Definition:

A clinical test for the undetermined factors of labor:

- Moulding of the head.
- Yielding of the pelvis.
- Dilatation of the cervix.
- Efficacy of uterine contractions.

Procedure:

- Trial is carried out in a hospital with available facilities for C.s.
- Adequate analgesia
- Nothing by mouth
- Avoid premature rupture of membranes
- The patient is left for 2 hours in the 2nd stage with good uterine contractions under close supervision to the mother and fetus.

Suitable cases for trial of labor:

- Young primigravida of good health.
- Moderate disproportion.
- Vertex presentation.
- No outlet contractions.
- Average sized baby.

Termination of trial of labor:

- 1) **Vaginal delivery:**
 - Either spontaneously or by forceps if the head is engaged.
- 2) **Cesarean section:**
 - Failed trial of labor i.e. the head did not engage or complications occur during trial as fetal distress or prolapsed pulsating cord before full cervical dilatation.

Contracted outlet

According to Tom's dictum:

- If the summation of posterior sagittal diameter + bituberous diameter $> 15\text{cm}$: Vaginal delivery with episiotomy + outlet forceps
- If the summation of posterior sagittal diameter + bituberous diameter $< 15\text{cm}$: CS

Indications for CS:

- Moderate degree of contracted Inlet (1st degree CPD): after failure of trial of labor.
- Major and extreme degree of contracted pelvis (2nd degree CPD).
- Contracted outlet after failure of trial of forceps.
- General indication for CS.

Congenital fetal malformations

LEARNING OBJECTIVES:

- To list different causes of congenital anomalies.
- To describe different methods of prenatal diagnosis of congenital anomalies.

Fetal anomalies can be defined as structural or functional anomalies, including metabolic disorders, which are present at the time of birth.

Etiology:

- Chromosomal or genetic disorders. (25% of cases)
- Maternal age; Mongols usually born to mothers over 35 years
- Drugs; during first trimester e.g. anticonvulsants and ACEI
- Irradiation during first trimester, X-ray and CT(> 25 Rads)
- Infections during first trimester TORCH, especially in early pregnancy
- Maternal metabolic disorders; e.g. diabetes mellitus
- Mechanical factors - oligohydramnios and amniotic adhesions
- Idiopathic.

Risk factors

- Maternal; age > 35 years
- Positive Family history
- Positive consanguinity

Diagnosis:

Non-invasive methods:

(A) Biochemical markers

- First trimester screening for Down between 10 - 14 wks.' gestation.
 ↓ PAPP-A and ↑ hCG.
- Second trimester screening for Down syndrome between 15 - 22 wks.' gestation.
 - Double test: ↓ MSAFP and ↑ free β-hCG
 - Triple test: ↓ MSAFP and ↑ free β-hCG and ↓ unconjugated estriol (uE3)
 - Quadruple test: ↓ MSAFP and ↑ free β-hCG, ↓ unconjugated estriol (uE3) and ↑ inhibin A.
- Screening for Neural tube defects:
 ↑ maternal serum alpha fetoprotein

(B) Ultrasonography:

Diagnoses anencephaly, Dandy-Walker syndrome and nuchal translucency, a soft tissue marker for chromosomal anomalies (mostly Down syndrome)

(C) MRI

(D) Invasive methods:

1) Chorionic villus sampling (CVS):

Definition: Aspiration of a sample of chorionic villi.

- This diagnostic test is usually performed between 10 and 13 weeks and involves aspiration of some trophoblastic cells.
- The amount of tissue obtained is small but sufficient for karyotyping, and with the development of PCR, rapid analysis is possible.
- It requires ultrasound guidance.

Indications

- For karyotyping if 1st trimester screening test suggests high risk for aneuploidy.
- For DNA analysis if parents are carriers of an identifiable gene mutation such as cystic fibrosis or thalassemia.

Benefits:

- Allows 1st trimester TOP if an abnormality is detected.
- Can be done before the pregnancy has become physically apparent.
- Rapid karyotyping as trophoblastic cells are more easily cultured than the squamous obtained by amniocentesis.

Risks:

- Miscarriage as a result of CVS is estimated at 1%.
- False negative results (rare) from contamination with maternal cells – especially with DNA analysis (PCR).
- Placental mosaicism producing misleading results- estimated at <1%.

2) Fetoscopy:

Technique:

A fine trans-abdominally fibreoptic endoscope (fetoscope) is introduced into the amniotic sac.

Clinical applications:

- Inspection of the fetus.
- Aspiration of the fetal blood or tissue samples
- Fetal therapy e.g. by giving thyroxin to a hypothyroid fetus.

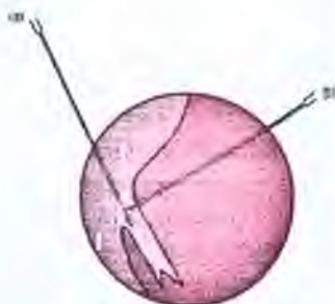
3) Cordocentesis:

Timing:

- From 16-18 weeks of pregnancy onwards.

Technique:

A sterile fine needle is introduced trans-abdominally into the umbilical vein or artery (at the placental insertion) under ultrasound guide.



Clinical applications;

- Fetal blood sampling to diagnose
- Fetal chromosomal abnormalities
- Fetal anemia as in Rh isoimmunization
- Fetal infection as in toxoplasma, rubella, cytomegalovirus infection
- Fetal therapy such as fetal blood transfusions in Rh isoimmunization.

Complications:

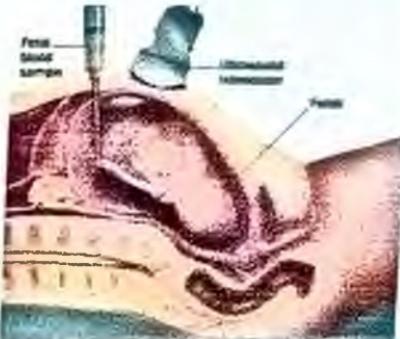
Abortion

Feto-maternal hemorrhage

4) Amniocentesis

Definition:

Amniocentesis means aspiration of the amniotic fluid (AF) by inserting a needle in the amniotic cavity trans-abdominally.



Technique:

- Placental site is localized by sonar; Bladder should be empty. Aseptic and antiseptic measures.
- A special needle ~ 6 inches long and 22 gauge' is inserted suprapubically into the amniotic cavity, after displacing the fetal head above the pelvic brim; 10-30 ml AF are withdrawn.
- This is usually undertaken from 15 weeks onwards. It involves aspiration of amniotic fluid which contains fetal cells shed from the skin and gut. It is performed trans-abdominally with ultrasound guidance.

Indications

- For karyotyping If screening tests suggest aneuploidy.
- For DNA analysis if parents are carriers of an identifiable gene mutation such as cystic fibrosis or thalassemia.
- For enzyme assays looking for inborn errors of metabolism.
- For diagnosis of fetal infections such as CMV and toxoplasmosis.

Benefits

- Less risk of maternal contamination or placental mosaicism.
- Miscarriage rate less than CVS.

Risks

- Failure to culture cells~ 0.5%.
- Full karyotyping may take 3 weeks (results for certain chromosomal abnormalities may be available more rapidly using PCR)

Indications:

Early at 15 weeks

- Genetic studies... (especially in old age or +ve history of CFMF)

- AF α -Feto-protein... (MS - α FP is easier)

In mid trimester → Δ OD 450 → plot on Lilly's chart

In third trimester

- For estimation of lung maturity:

- L/S ratio >2 OR Lecithin / Phosphatidyl glycerol $\geq 2\text{mg}^{\circ}\%$.
- Bubble stability test.
- Nile blue sulfate test (Mature shedded fetal epithelial cells)
- Creatinine concentration $>2\text{mg}^{\circ}\%$

- Therapeutic:

- Tapping of polyhydramnios

- Risks:

- Injury to bladder, intestine, vessels
- PROM → abortion or PTL
- Injury to fetal vessels → fetal hemorrhage.
- Infection → septic abortion or chorioamnionitis
- Trauma to fetal organs (puncture)

Pre-implantation diagnosis: (Blastomere Biopsy)

- In cases of in-vitro fertilization (IVF), one cell (blastomere) is aspirated from an 8 cell stage embryo (3 days) through a hole made in the zona pellucida for genetic studies.
- Only healthy embryos are transferred to the uterus.

Structural anomalies

Gastrointestinal

Abdominal wall defects

- Omphalocele and gastroschisis
- Management: routine follow-up U/S, route of delivery dictated by obstetric indications, surgical correction after birth.
- If other anomalies are visualized on U/S, amniocentesis is required to rule out trisomy 18 and trisomy 21.

Duodenal atresia

- Diagnosis: "double bubble" sign on U/S (dilated stomach and duodenum), polyhydramnios.
- 30% of fetuses have trisomy 21.

Nervous system defects

Neural tube defects (NTDs)

- Failure of neural tube to close between days 26 and 28 of gestation.
- Folate supplementation decreases risk of NTDs.
- Anencephaly: fatal anomaly with absence of cranium.
- Spina bifida: opening in vertebral column.
- Meningocele: herniation of meninges and spinal cord.
- Meningoencephalocele: herniation of meninges, spinal cord and brain.
- U/S findings: "banana sign" (exaggerated cerebellar curve), "lemon sign" (scalloping of frontal bones),
- Polyhydramnios, malpresentation often accompanies defect.

Features of omphalocele and gastroschisis

	Omphalocele	Gastroschisis
Herniation	Through umbilicus	Right of umbilicus
Peritoneal covering	Yes	No
Associated anomalies	Common	Rare
Survival	50%	80-90%

Choroid plexus cysts (CPCs)

- Most are normal variants.
- Aneuploidy found in 2% of fetuses.

Cardiovascular defects

Structural defects

Most common: Atrio-ventricular septal defects, VSD, tetralogy of Fallot (VSD, right ventricular obstruction, overriding aorta and right ventricular hypertrophy)

Arrhythmias

Isolated premature atrial contractions (PACs) are most common (80%) PACs are transient and require no treatment.

Genitourinary anomalies

- Fetal renal pelvic dilation >4 mm followed with serial US.
- Most cases of mild pyelectasis are normal variants.
- Etiology of urinary obstruction: uretero-pelvic junction obstruction, and posterior urethral valves.

Thoracic anomalies

- Congenital diaphragmatic hernia.
- Congenital diaphragmatic hernia

- Incomplete fusion of diaphragm with herniation of abdominal contents into thorax
- U/S: visualization of loops of bowel in the thorax, small abdominal circumference, mediastinal shift.

Facial Anomalies

- Cleft lip and cleft palate common
- Inheritance: multifactorial (recurrence in subsequent births).

Limbs anomalies

Teratogenic drugs

Antibiotics

- Streptomycin → Auditory (Nerve deafness)
- Sulphonamides → Jaundice and Kermicetus
- Aminoglycosides → Nephrotoxic
- Chloramphenicol → Gray syndrome
- Tetracycline → Discoloration of teeth

Hormones

- Corticosteroids → Cleft palate
- Contraceptive pills → VACTREL syndrome
- Androgens → Virilization of female fetus
- Diethylstilbestrol → Vaginal adenosis and adenocarcinoma

Oral anti-coagulant (Coumarins)

- Chondrodysplasia punctata (saddle nose, mental retardation, cataract).
- Fetal hemorrhage.

Cytotoxic drugs → Abortion and CFMF

Anti-thyroid drugs → Goiter and mental retardation

Salicylate → Fetal hemorrhages.

Antiepileptics → May be teratogenic.

Fetal hypoxia during pregnancy

Physiology:

Passage of oxygen from the mother to the fetus depends on the following:

- Maternal oxygenation.
- Placental function.
- Normal circulation in the umbilical cord.
- Vasomotor center in the fetal medulla.

Causes of placental insufficiency (fetal hypoxia):

Maternal causes:

- Hypertension and chronic nephritis.
- Diabetes mellitus with vascular changes in the placenta.
- Antiphospholipid antibody syndrome.
- Cardiac causes e.g. Heart failure.
- Severe anemia "Anemic hypoxia"

Fetal causes:

- Twins.
- Post-term pregnancy.
- Erythroblastosis fetal is due to fetal anemia.
- Fetal infections e.g. TORCH

Placental causes leading to acute placental insufficiency:

- Placenta previa or accidental hemorrhage.
- Circumvallate placenta.

Umbilical cord causes leading to acute placental insufficiency:

True knots or tight coils of the cord around the fetal neck.

Complications:

- Intrauterine growth retardation in cases of chronic hypoxia.
- Intrauterine fetal death (IUDF)
- Neurological abnormalities and mental retardation.

Clinical picture: it is suspected from:

- History of the cause.
- Poor weight gain during pregnancy.
- Undersized uterus.

Fetal heart rate monitoring

LEARNING OBJECTIVES:

- To list different methods of antepartum and intrapartum of fetal wellbeing
- To list the identifications of assessment
- To differentiate the normal and abnormal results of the different tests

Antepartum fetal surveillance

(Placental insufficiency tests)

A. Daily fetal movement count (DFMC):

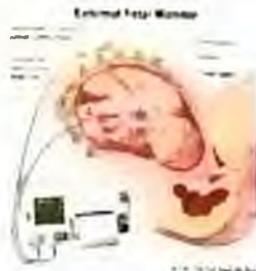
Idea:

It depends on the fact that fetal hypoxia causes depression of the CNS center which controls fetal movements.

Time:

It is done after fetal viability i.e. after 28 weeks.

Fetal movements considered reduced if less than 10 movements in 12 hours. Fetal death occurs 12-48 hours after complete cessation of the movements.



B. Antepartum fetal heart rate testing:

I- Non- stress test (NST):

Principle:

NST measures the intactness of the fetal autonomic and central nervous systems during the fetal movements reflecting the "fetal reserve". Normally, FHR accelerates in response to the fetal movements.

Technique:

FHR is continuously recorded by the external monitor for 20 minutes. Fetal movements are recorded.

Results:

- Reactive pattern is one in which 2 or more movements are accompanied by acceleration of FHR of 15 bpm and lasting for 15 seconds or more. A reactive pattern means that the fetus will survive safely for at least one week more and so it is repeated weekly.
- Non-reactive pattern means absence of FHR acceleration in response to the fetal movements. Nonreactive NST requires immediate follow-up with contraction stress test.

II- Contraction stress test (CST):

Principle:

CST measures the probability of placental insufficiency in response to the stress of labor - like uterine contractions; reflecting the "placental reserve". Uterine contractions reduce the utero-placental blood flow. If there is placental insufficiency, the FHR shows late deceleration.

Technique: Two transducers (detectors) are applied to the mother's abdomen; one to record FHR and the second to record uterine activity. A small dose of oxytocin (0.5 µU/minute) is given IV. by the drip method and gradually increased until 3 uterine contractions occur every 10 minutes.

Results:

- Positive test – is one on which FHR shows late decelerations in response to uterine contractions'.
- Negative test means absence of FHR deceleration in response to uterine contractions. A negative CST means that the fetus will survive safely for at least one week more and so it is repeated weekly.
- Un-satisfactory if no contractions occurs

Contraindications:

Women at high risk for preterm labor;

- a) Multiple pregnancy,
- b) Incompetent cervix and
- c) Premature rupture of membranes.

III- Ultrasound, BPP and Doppler

1. Ultrasound:

Repeated measurements of the fetal biparietal diameter (BPD), transverse diameter of the abdomen at the level of umbilical vein (once weekly) will reveal intrauterine growth retardation (IUGR).

2. Fetal biophysical profile (BPP):

Idea: It depends on the fact that fetal hypoxia causes depression of CNS centers which control certain fetal biophysical factors.

Time: After fetal viability i.e. after 28 weeks.

Biophysical factor	0	2
Non stress test	Non-reactive	Reactive
Fetal breathing movement	Absent	>30 seconds in 30 minutes
Fetal limb movement	Absent	3 or more in 30 minutes
Fetal tone	Flaccid	Flexion
Amniotic fluid	Oligohydramnios	Not decreased

Breathing, limb movements, fetal tone and AF are assessed by ultrasound.

Result:

- Score 8 or 10: Normal. BPP is repeated after 1 week .
- Score 6: Equivocal. BPP is repeated after 48 hours.
- Score<4: fetal hypoxia. Termination of pregnancy is essential.

Modified BPP:

- A non-stress test (indicator of acute hypoxia) is performed twice weekly and combined with AFI (indicator of chronic hypoxia).

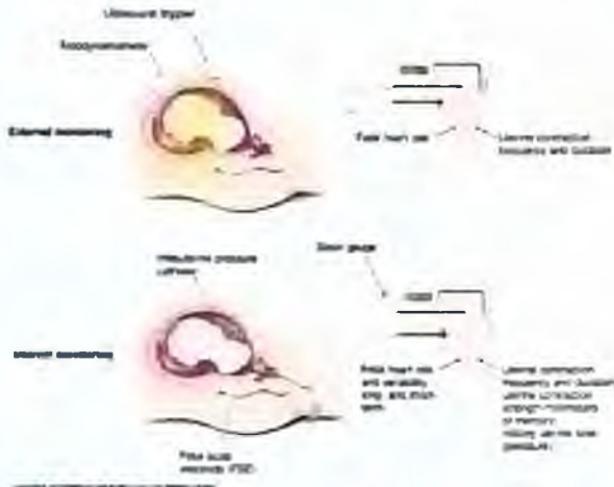
- This abbreviated biophysical profile requires approximately 10 minutes.

3. Doppler ultrasound:

- Used to assess the blood flow in the umbilical, fetal & maternal vessels.
- Impaired utero-placental blood flow indicates fetal hypoxia.

4. Biochemical tests e.g. serum estriol:

- These tests are expensive, time consuming and not accurate i.e. not used.
- Management: Depends on whether there is IUGR or IUFD (see later)



Intrapartum fetal heart rate monitoring

Intrapartum fetal monitoring

Electronic fetal heart monitoring

Intrapartum monitoring has become an integral part of modern obstetrics

- External fetal monitor (EFM) or internal fetal scalp electrode(FSE)
- FSE more accurate assessment but requires rupture of membranes.

Indications:

- No difference in intrapartum death rates between continuous monitoring and intermittent auscultation.
- ACOG guidelines
 - Active labor: auscultation or EFM strip evaluation q15 minutes.
 - Second stage: auscultation or EFM strip evaluation q5 minutes.



1- Baseline FHR:

- Normal: 110- 160 bpm.

- Baseline bradycardia:

baseline <110 bpm for at least 15 minutes

Etiology: prolonged decelerations, fetal academia, congenital heart block, maternal hypothermia.

- Baseline tachycardia:

baseline > 160 bpm

Etiology: chorioamnionitis, maternal fever, cardiac arrhythmias, sympathomimetic drugs

2- Variability:

Normal fetal heart rate exhibits beat-to-beat changes secondary to autonomic nervous activity.

Short-Term variability:

- Changes in fetal heart rate over 1 min
- Decreased or absent long-term variability is most reliable sign of fetal academia, compromise.
- Other causes of decreased long-term variability: analgesics, MgSO₄

3- Accelerations:

- Increases in fetal heart rate above baseline.
- Reactive: Two 15- sec accelerations of at least 15 bpm in 20 minutes.
- Sign of fetal well-being

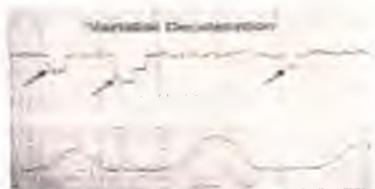
4- Decelerations:

- Decreases in fetal heart rate below baseline.
- Variable deceleration
 - Result of umbilical cord compression
 - Occur any time in relation to contraction
 - Abrupt onset and return to baseline
 - Prolonged, severe variable decelerations with loss of variability are sign of impending fetal acidosis.
 - Management: place FSE, give O₂, change maternal position, discontinue oxytocin, begin amnioinfusion.
- Early decelerations:
 - Result of fetal head compression.
 - Begin with a contraction and end shortly after contraction.
 - Symmetric shape.
 - Common in second stage of labor.
 - Management: usually not required.

- Late decelerations:
 - Result of utero-placental insufficiency.
 - Begin after the peak of a contraction.
 - Return to baseline after the contraction.
 - Smooth, rarely drop >40bpm below baseline.
 - Management: FSE, give O₂, change maternal position.

N.B Repetitive late decelerations are an ominous sign: Required fetal scalp sampling or delivery required.

- Sinusoidal heart rate:
 - Regular oscillations around baseline.
 - Etiology: fetal anemia, analgesics, severe acidosis.
 - Diagnostic criteria:
 - Baseline 120- 160bpm.
 - Loss of short term variability
 - Amplitude of 5-15 bpm above and below baseline.
 - 3-5 cycles min.



Variable Decelerations



Early Decelerations



Sinusoidal pattern

Early decelerations

Fetal scalp sampling:

- Done if abnormal fetal heart rate.
- Determine fetal PH.
- If academia noted, operative delivery indicated.
- If PH is normal, Labor may continue.

Procedure:

- Amnioscope placed in vaginal vault, head visualized.
- Area on scalp dried with a swab, coated with silicone gel.
- Small puncture made on fetal scalp.
- Blood collected into capillary tube and PH immediately measured.

Management:

PH	Management
>7.25	Observe (continue labor)
7.20– 7.25	Repeat sample in 30 minutes
< 7.20	C- section

B. Fetal pulse oximetry:

- Continuous monitoring of fetal O₂ saturation by trans-cervical catheter against fetal cheek.
- Risk of fetal acidosis low if fetal O₂ saturation remains >30%.
- If fetal O₂ saturation <30% for >10 minutes, incidence of fetal acidosis increases.

C. Other Techniques:

Vibroacoustic stimulation or fetal scalp stimulation performed for decreased variability.

Preterm labor

LEARNING OBJECTIVES:

- To list the different causes of preterm labor.
- To recognize the prophylaxis of pre-term labor.
- To state the management of preterm labor with special emphasis on tocolysis and role of corticosteroids.
- To list the hazards of prematurity

Definition

The onset of labor (regular uterine contractions associated with cervical changes) occurring after 24 weeks and before 37 completed weeks of gestation.

Etiology and risk factors

There are three major etiological factors that contribute to preterm labor:

- Preterm pre-labor rupture of membranes (PPROM)
- Spontaneous preterm labor in pregnancies with intact membranes
- Complications of pregnancy affecting fetal and maternal health and requires delivery

Risk factors for spontaneous preterm labor

- Previous preterm labor
 - The recurrence risk of preterm labor varies from 15% to 40% after one prior preterm birth and significantly increases with two or more preterm labors.
- Uterine over distension, e.g., multiple pregnancy, hydramnios
- Vaginal infection

Bacterial vaginosis associated with preterm labor. In recent years, the most popular theory for one cause of preterm labor has been intrauterine infection.

- Uterine abnormalities
- Incompetence of the cervix
- Poor nutrition, smoking and poor weight gain during pregnancy
- Young maternal age

Diagnosis

History of previous pregnancy with occurrence of preterm labor History of risk factors, e.g., multiple pregnancies

Warning symptoms (vaginal bleeding, ROM)

History suggestive of vaginal infection: vaginal discharge or dysuria

- Past medical and surgical history

Physical examination

- FL. correlated with the gestational age

- Uterine contractions, frequency and duration
- Palpate renal angle for tenderness

Local examination

Perform a sterile vaginal examination to assess:

- Cervical effacement and dilation
- Station and nature of the presenting part

The diagnosis of preterm labor is based on the following criteria:

- Uterine contractions, (>4 per hour needed to cause cervical change).
- Cervical changes: cervical effacement or cervical dilatation of 2 cm or more

Laboratory investigations

- Urine analysis and culture
- Swab of the lower vagina for culture

Ultrasonic examination

- Assess fetal gestational age and weight
- Assess placenta site and grade
- Assess cervical length

Management of preterm labor

Indications to allow labor and delivery to proceed

- Cervix is dilated 4 cm.
- Membranes are ruptured.
- Evidence of chorioamnionitis.
- IUFD or fetal congenital anomalies
- Severe fetal distress
 - Severe IUGR
 - Abruptio placentae and severe pre-eclampsia

Indications to inhibit preterm labor and initiate (tocolysis)

- Membranes are intact.
- Gestational age is < 34 weeks.
- There is no overt maternal or fetal infection.
- Cervix is dilated < 4 Cm.
- There is no evidence of placental insufficiency

Identify women at risk for preterm labor:

- Patient education to identify early symptoms and signs, so that patients are admitted early to allow initiation of tocolytic therapy.
- Treat vaginal infections.

First aid management

- Admit the patient to the labor ward and put her on complete bed rest.
- Insert an IV cannula.
- Give steroids if the gestational age is < 34 weeks.

Active management

If the gestational age is < 34 weeks:

- Tocolysis see below
- Antibiotics: Prophylactic antibiotics to prevent the progression of silent infection to clinical chorioamnionitis
- Corticosteroids: Dexamethasone 8 mg/12 hours for 4 doses or betamethasone 12 mg 24 hours for 2 doses to promote fetal lung maturation < 34 weeks gestation.

If the gestational age is > 34 weeks: Allow delivery,

Tocolytic agents

Definition: These are drugs that inhibit uterine contractions

Contraindications:

- Cervical dilation > 4cm
- Uterine bleeding
- Intrauterine infections
- Acute or chronic fetal distress.
- Fetal anomalies
- Adequate fetal lung maturation

The aim of this short term treatment:

- To give time for corticosteroid administration to accelerate the lung maturity
- To give time for transfer to neonatal intensive care units

Types:

1. β -adrenergic receptor stimulants (β_2 agonists):
 - These drugs include Isosuprane and Ritodrine
 - The mechanism of action: Stimulate the β_2 type of adrenergic receptors in the myometrial cells inhibition of uterine activity.
 - Side effects

On the FV's: VD hypotension, tachycardia, palpitations pulmonary edema specially when given with corticosteroids.

Metabolic effects: hyperglycemia, hypokalemia and lactic acidosis.

2. Calcium channel blockers as Nifedipine (Epidate).

- The mechanism of action: uterine muscle relaxation is by reducing available calcium within myometrial cells
- Dose: An initial oral dose of 20 mg followed by 10 mg 20 minutes for 4 doses then 4 times daily, adjusted according to uterine activity for up to 48 hours.
- Side effects:
 - a) Cutaneous flushing.
 - b) Hypotension and

c) Tachycardia, so it is contraindicated in cardiac patient owing to the risk of pulmonary edema.

3. Oxytocin antagonist (Atosiban):

- The mechanism of action: A synthetic competitive inhibitor of oxytocin. It binds to myometrial cell oxytocin receptors resulting in a dose-dependent inhibition of intracellular calcium release.
- Expensive and effective.

4 Prostaglandin synthetase inhibitors (Indometacin)

- The mechanism of action: Inhibition of uterine contractions by inhibiting prostaglandin synthesis
- Dose: Indomethacin 100 mg suppository initially, followed by 25 mg orally every 6 hours for 48 hours.
- Side effects: If given >32 weeks, it may lead to premature closure of ductus and may affect fetal kidneys.

5. Magnesium sulfate:

- The mechanism of action: antagonize the action of Ca^{++}
- It is the best tocolytic in DM patients.
- Administration of magnesium sulphate to women considered at risk of preterm birth reduces the risk of cerebral palsy (Fetal neuro-protection)

Post-term pregnancy

Definition:

- A pregnancy that persists for 42 weeks or more from the onset of the last menstrual period.
- Sometimes called postmaturity or postdate.

Incidence: 5-10%. It is more common in primigravidae.

Etiology

- Unknown, but hereditary, hormonal and non-engagement of the presenting part are suspected factors
- Anencephaly

Complications of post-term pregnancy

- Placental insufficiency, which may lead to fetal hypoxia or even death.
- Oligohydramnios with its sequelae particularly cord compression during labor.
- Obstructed labor: due to oversized baby, no moulding of the skull due to more calcification.
- Increased incidence of operative delivery.

Diagnosis

(A) Antenatal:

- History: calculation of gestational age.
- Examination: larger baby size.
- Ultrasonography can detect:
 - Biparietal diameter more than 9.6 cm.
 - Increased fetal weight.
 - Oligohydramnios.
 - Increased placental calcification.

(B) Postnatal:

- Baby length: more than 54 cm.
- Baby weight: more than 4.5 kg.
- Skull well ossified with smaller fontanelles.
- Finger nails: project beyond finger tips.

Management

Termination of pregnancy at 41 weeks is indicated which may be by:

- Induction of labor if the conditions are favorable for vaginal delivery using amniotomy ± oxytocin, or prostaglandins ± oxytocin.
- Cesarean section: if conditions are not favorable for vaginal delivery, or if induction of labor failed.

Intrauterine growth restriction (IUGR)

Definition:- Infant's weight is less than the 10th percentile of its gestational age. (It is suspected when the fetal size is less than the gestational age)

Etiology:

A- Chromosomal and genetic disorders:

- Down's syndrome.
- Turner's syndrome.
- Renal agenesis.

B- Intrauterine infections: TORCH

C- Maternal factors:

- Severe malnutrition.
- Hypertensive disorders: pregnancy-induced hypertension, essential hypertension.
- Heart diseases and marked anemia.
- Diabetes mellitus.

D- Idiopathic



Types:

- **Symmetric IUGR (20%)** - early onset: due to genetic, infective or teratogenic factors. The head abdomen ratio is normal throughout; but both are smaller than they should be for the period of amenorrhea.
- **Asymmetric IUGR (80%)** - late onset: due to inadequate fetal nutrition. The head grows normally for the period of amenorrhea, but the abdomen is smaller than expected. Head (brain) sparing is explained by the fact that the greatest part of the cardiac output with the most oxygenated blood is directed to the fetal head. Therefore, it is the last part of the fetus to suffer from malnutrition.

Diagnosis:

History: of any of the etiological factor

Examination:

- Poor maternal weight gain or even weight loss during pregnancy.
- Fundal level is less the period of amenorrhea.
- Oligohydramnios.
- Underlying cause may be detected.
- The neonate shows signs of dysmaturity.

Investigations:

- **Serial ultrasonography** may show:
 - Smaller biparietal diameter and abdominal circumference
 - Congenital anomalies and oligohydramnios.
 - Doppler ultrasound: Increase systolic/diastolic velocity ratio in the umbilical artery.
- Daily fetal movement count: < 10 movements /12 hours.
- Antenatal cardiotocography: Non-stress test: non-reactive.
- Stress test: late decelerations.
- Biophysical profile: is poor

Management:

A. Antenatal:

- Rest in bed in left lateral position to prevent supine hypotension syndrome.
- Smoking should be discouraged.
- Treatment of the underlying cause.
- Monitoring of fetal wellbeing.

B. Intrapartum:

I. Mode of delivery depends on :

- Gestational age.
- Result of the stress test.
- Associated factors as malpresentation, APH, previous CS ...etc.

- Cesarean section is the rule (especially if there are associated adverse factors) as the fetus does not tolerate the reduced oxygen supply and the birth trauma encountered during vaginal delivery

2. Continuous intranatal monitoring.

- C. Postnatal: Identification and management of problems of dysmaturity.

Generalized fetal enlargement (Macrosomia)

Definition: A fetal weight of more than 90th percentile ($>45.5\text{Kg}$)

Causes:

- Genetic or constitutional large women tend to give birth to large babies
- Diabetes and prediabetes
- Post-dates (postmaturity)
- Multiparity: The first baby is about 100 gm smaller than the next.
- Hydrops fetalis.

Risk factors:

- Excessive maternal weight gain during pregnancy
- Advanced maternal age
- Male fetus than female
- Previous macrosomic infant.

Diagnosis:

- Clinical palpation can give a rough idea.
- Ultrasonography: can calculate the fetal weight.

Hazards

- Prolonged pregnancy.
- CPD.
- Obstructed labor.
- Shoulder dystocia.
- Meconium aspiration syndrome.
- Nerve and bone injuries.
- Future baby obesity.

Management:

- Proper antenatal care: to prevent macrosomia and diagnose it before labor commences.
- Cesarean section: is the safest for both mother and fetus.

Hydrocephalus

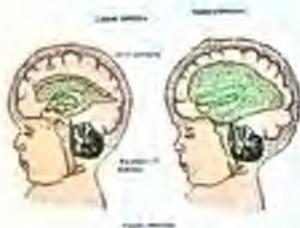
Definition:

It is an enlargement of the fetal head due to accumulation of excessive cerebro-spinal fluid (C.S.F) within the ventricles.

Etiology:

Obstruction of aqueduct of Sylvius which may be due to:

- Genetic aberration as trisomies.
- Infections: as cytomegalovirus, toxoplasmosis and rubella.
- No detected cause.



Diagnosis:

During pregnancy:

- Breech presentation in 50% of cases.
- Head is large with soft bones.

During labor:

Cephalic presentation:

- Thin compressible skull bones.
- Wide sutures and large fontanelles.

Breech presentation:

- Retained large after-coming head.
- Spina bifida is common (30%).

Ultrasound:

- Large head with biparietal diameter >12 cm (not in every case)
- Small face in relation to the head size.
- The thickness of cerebral cortex which determines postpartum prognosis of the fetus can be measured by ultrasound.

Complications:

- Obstructed labor: with its sequel as rupture uterus . This is more common in mild degrees of hydrocephalus which cannot be detected before or during labor.
- Fetus: Still birth or live birth with neurological manifestations and low growth rate.

Management:

- CS
- The living newborn should be referred for shunt operation to drain the cerebral ventricles into the jugular vein or right atrium.

Still birth & Fetal birth injuries

LEARNING OBJECTIVES:

- To list the different causes of intrauterine fetal death
- To enumerate the complications of intrauterine fetal death
- To describe diagnosis of intrauterine fetal death
- To describe the management of intrauterine fetal death

Still birth

Definition: intrauterine fetal death after fetal viability i.e. 24 weeks.

Types:

(A) Antenatal fetal death (after the age of viability and before the onset of labor)

Etiology:

A- Intrauterine infections TORCH

B- Maternal factors maternal diseases with pregnancy

- Hypertensive disorders, pregnancy induced hypertension, essential hypertension
- Heart diseases and marked anemia
- Diabetes mellitus

C- Placental

- Premature separation of the placenta abruption placentae or placenta previa
- Placental insufficiency

D- Fetal

- Congenital fetal malformations.
- Rh isoimmunization

E- Idiopathic

Diagnosis:

(a) Symptoms:

- Regression of pregnancy symptoms - as breast symptoms, but sometimes milk secretion may start spontaneously
- Cessation of fetal movements
- failure of the abdomen to increase in size
- Prune juice (dark brown) vaginal discharge may occur.

(b) Signs:

- Uterine size is smaller than expected.
- Uterine growth ceases the uterus fails to enlarge on repeated examination.
- Fetal parts are difficult to distinguish due to loss of tone.
- FHS are absent.

(c) Investigations:

- Pregnancy test becomes negative within 2 weeks following fetal death; but may remain positive for a longer period (if there is living chorionic).
- Sonar- absence of cardiac activity (the most reliable sign), collapsed fetal skull.
- X-ray: can show:
 - Intra-fetal gas - nitrogen bubbles may appear in the heart and large vessels (**Robert's sign**) as early as 12 hours following fetal death (the earliest sign).
 - Overlapping of fetal skull bones (**Spalding's sign**) occur one week following fetal death- caused by liquefaction of the brain and absorption of the cerebrospinal fluid (CSF).
 - Hyperflexion attitude (**Ball's sign**).
 - Angulation of the spine and collapse of the thoracic cage.
 - Rarefaction of bones.
 - Causative factor- anencephaly, hydrops fetalis and syphilitic affection.

Complications:

- Infection.
- Coagulation defects- if the dead fetus is retained more than 5 weeks (Retained Dead Fetus Syndrome).

Management:

- Blood should be tested for coagulation defects.
- A wait 2-4 weeks after fetal death; so that the uterus may expel its content spontaneously; otherwise interference is indicated.
- Immediate interference is indicated if there is (a) infection; (b) marked bleeding; (c) coagulation defects; or (d) anxiety.
- Labor is induced by medical measures only - prostaglandins (vaginal suppositories' intra-amniotic or IV. drip) or oxytocin drip. Amniotomy is not advisable because it may lead to serious infection.
- Cesarean section is indicated, if the above measures fail.

(B) Intrapartal fetal death (after the onset of labor):

- Intrauterine Asphyxia .
- Intrauterine (congenital) pneumonia - due to premature rupture of membranes.
- Birth injuries - intracranial hemorrhage' fracture dislocation of cervical spine; hepatic or splenic rupture.

Fetal birth injuries

Head injury

(A) Intracranial hemorrhage:

Etiology:

- Marked compression e.g., forceps or vacuum delivery.
- Rapid compression-decompression after- coming head or precipitate labor.
- Prematurity low or fragile blood vessels.

Sites:

- Subdural / Subarachnoid
- Periventricular, intraventricular, intracerebral
- Cephalo-hematoma (DD: caput succedaneum).
- Management:
 - Prophylaxis → proper management of labor → avoid traumatic delivery.
 - Active – vitamin k (1mg I.M)
 - Oxygen, anticonvulsants

(B) Fractures of the skull:

- Linear → more common, heal without complication (within days)
- Depressed → occasional, Treated by elevation.

Muscle or skeletal:

(A) Fracture clavicle:

- The most common fracture in newborn.
- Management
- If the fragments of bone are not dislocated → 8 shaped- figure bandage.

(B) Fracture of long bones:

- The most common is humerus and femur.
- Management → immobilization by elastic bandage for 2-3 wks.

(C) Injury to sternomastoid muscle:

- The infant holds the head to one side (torticollis)
- A mass (1-2cm) is noticed → complete recovery in 2-3m

Peripheral nerves:

(A) Brachial plexus palsy

Etiology: Shoulder dystocia or traction on the after coming head

Types:

- Erb's palsy → C5,6
 - Waiter's tip " posture
 - Moro reflex is asymmetrical

- **Klumpke's paralysis C8 to T1**

- Flexor and extensor muscles of the wrist are weak.
- The grasp reflex is impaired.
- Horner's syndrome (involvement of T1 sympathetic fibers)

Treatment:

Most infants show recovery within 2-3 weeks ± passive exercises.

(B) Facial palsy

Etiology: forceps

Treatment:

- Dribbling is observed during sucking (most infants recover in 3-4d)
- The eyes should be protected with methyl-cellulose drops.
- Patients should be re-examined to differentiate neurapraxia (edema of the nerve) from neurotmesis (true nerve injury)

Soft Tissue

(A) Lacerations:

- Head lacerations → scalpel during CS, scissors during episiotomy.
- Vulval lacerations → in frank breech presentations.

(B) Scalp Abscesses:

- Occasional complication of internal monitoring

(C) Abdominal organs:

- Internal he during breech extraction (specially liver, spleen, kidneys)

Rhesus isoimmunization (Immune hydrops)

LEARNING OBJECTIVES:

- To take history from RH Iso-immunization patient.
- To list causes of RH Iso immunization and sequelae of antigen antibody reaction
- To state the pathologic and clinical effects of hemolysis on the fetus and neonate
- To state methods of antenatal diagnosis
- To describe prophylaxis against RH Iso-immunization
- To outline the management of the Rh sensitized patient.

Fetal hydrops

Definition

Fetal hydrops is the abnormal accumulation of serous fluid in two or more fetal compartments. This may be pleural or pericardial effusions, ascites, skin edema, polyhydramnios, or placental edema. It may be divided into non-immune and immune causes.

Patho-physiology

- Immune hydrops results from fetal anemia that is due to blood group incompatibility between the mother and the fetus.
- Non-immune hydrops results from other causes, including fetal anemia that is due to other causes such as fetal infection.

Non-immune fetal hydrops

Main causes:

- Severe anemia
 - Congenital parvovirus B19 infection.
 - A – thalassemia major common in areas such as south- east Asia)
 - Glucose-6-phosphate dehydrogenase deficiency.
- Cardiac abnormalities, including:
 - Structural abnormalities.
 - Fetal tachyarrhythmia (SVT or atrial flutter)
 - Congenital heart block.
- Chromosomal abnormalities including:
 - Trisomies 13, 18 and 21.
 - Turner's syndrome (45X0).
- Other genetic syndromes, including:
 - Multiple other syndromes, e.g. achondrogenesis, myotonic dystrophy.

- Other infections
 - Toxoplasma
 - Rubella.
 - Cytomegalovirus (CMV)
 - Varicella.
- Other structural abnormalities, including:
 - Diaphragmatic hernia
 - Pleural effusions.
- Twin-to-twin transfusion syndrome
 - Recipient from volume overload and donor from anemia.
- Placental
 - Chorioangioma.

Diagnosis

- Ultrasound
 - The diagnosis is made by an ultrasound scan.
 - Associated structural abnormalities may be seen
 - Fetal echocardiography is required to diagnose cardiac lesions.
 - Peak systolic velocity in the middle cerebral artery identifies fetal anemia.
- Fetal blood or amniotic fluid sampling
 - Fetal blood sampling if anemia is suspected (with blood ready for in-utero transfusion).
 - Amniotic fluid or fetal blood for chromosome analysis and also virology.
- Maternal blood testing
 - Virology (initially for parvovirus).
 - Consider hemoglobin electrophoresis for α-thalassemia trait.

Treatment

- The prognosis depends on the underlying cause. Where treatment is not possible the option of termination of pregnancy should be discussed. In the 3rd trimester, delivery may be a better alternative than in-utero treatment.
 - If severe polyhydramnios is present, removal of excess amniotic fluid (amnioreduction) may reduce the risk of preterm labor.
 - Treatable causes of non-immune fetal hydrops
- Fetal anemia
- In-utero blood transfusion may be performed.

Pleural effusions

- In-utero percutaneous drainage and subsequent insertion of shunt into amniotic fluid may be possible.

Twin-to-twin transfusion syndrome

- Laser photocoagulation of placental anastomoses improves the prognosis.

Cardiac

- Tachyarrhythmias may be treated with maternal digoxin.

Rhesus isoimmunization (Immune hydrops)

Definition

Rhesus isoimmunization occurs when a maternal antibody response is formed against fetal red cells. These IgG antibodies cross the placenta and cause fetal red blood cell destruction. The ensuing anemia, if severe, precipitates fetal hydrops which is often referred to as immune hydrops.

Rhesus blood groups

The rhesus system consists of three linked gene pairs; one allele of each pair is dominant to the other: C/c, D/d, and E/e. There are only five antigens as d is not an antigen; it merely implies the absence of D. Inheritance is Mendelian. The D gene is the most significant cause of isoimmunization.

Pathophysiology of rhesus disease

- Fetal cells cross into the maternal circulation in normal pregnancy; the amount is increased during particular "sensitizing events".
- The fetus may carry the gene for an antigen which the mother does not have with rhesus D, the fetus may be D/d (rhesus D positive) whilst the mother is d/d (rhesus D negative).
- Individuals exposed to a "foreign antigen mount an immune response (sensitization); initially this is IgM, which cannot cross the placenta so this pregnancy is not at risk (Primary immune response).
- Re-exposure in a subsequent pregnancy causes the primed memory B cells to produce IgG, which activity crosses into the fetal circulation. IgG binds to fetal red cells, which are then destroyed in the reticulo-endothelial system (Secondary immune response)
- This causes a hemolytic anemia (if erythropoiesis is inadequate to compensate, severe anemia cases high output cardiac failure, fetal hydrops¹ and ultimately, death)
- In milder cases, hemolysis leads to neonatal anemia, or jaundice from increased bilirubin levels.

Clinical varieties

	Congenital hemolytic anemia	Ikterus gravis neonatorum	Hydrops fetalis
Incidence	Rare	Commonest	Rarest
Severity	Mild affection	Moderate	Most severe
Anemia	Mild in first 2 weeks	Severe in the first few days after birth, may be at birth	Severe intrauterine -> heart failure -> edema-ascites
	Mild neonatal jaundice	Never jaundiced at birth (WHY?) and never delayed more 48 hours. Mainly unconjugated if more 20mg % 4 kernicterus (occurs at a lower levels in preterm fetus)	Usually born dead if alive die after few hours. Placenta is large and edematous

* In icterus gravis neonatorum the fetus is never jaundiced at birth as the maternal liver can deal with the fetal bilirubin

Potential sensitizing events for rhesus disease

- Termination of pregnancy or evacuation of retained products of conception (ERPC) after miscarriage.
- Ectopic pregnancy.
- Vaginal bleeding >12 weeks, or earlier if heavy.
- External cephalic version (ECV).
- Blunt abdominal trauma.
- Invasive uterine procedure, e.g. amniocentesis or CVS.
- Intrauterine death.
- Delivery.

Prevention:

- Screening all pregnant females for Rh typing.
- Rh -ve females: should not receive any RH +ve blood transfusion.
- Unsensitized Rh negative women who are exposed to potentially sensitizing agent should receive Anti-D Antibodies destroy fetal RBCs. in maternal circulation and prevent sensitization
 - a) If after 20 weeks, give Anti D Ab300 microgram IM within 72 h.
 - b) If before 20 weeks give 50 microgram only

Investigations and management:

1-ABO and Rh typing

- If the woman is Rh negative and the husband is Rh positive, Geno typing of the husband can be done and fetal blood type can be assessed by free fetal DNA or amniocentesis.

2-Investigations to detect Anti-Rh Antibodies (Indirect Coomb's Test)

- It is done for the mother to detect Rh antibodies in maternal serum.
- Mother's serum incubated with Rh+ve RBCs and is suspended in saline (If the serum has antibodies, it will attach to the RBCs) Add antihuman Globulin serum to (suspension). If Abs are present, the patient is sensitized.
- If antibodies are not found initially, screening should be repeated because they may develop later (at 28, 34 weeks).
- If antibodies are positive, Level should be measured serially every month till 28 weeks than every 2weeks.
- Antibody titer is $> 1/32$ (> 4 IU/ml) indicates that the fetus may be affected and further investigations needed.

3-Ultrasound

- a. **Buddha attitude** (extension of vertebral column and prevention of knee flexion by edema of the fetus) with halo around the fetal head due to edema in case of hydrops fetalis
- b. **Middle cerebral artery peak systolic velocity**
 - In anemic fetuses the peak MCA systolic velocity increases because of increased cardiac output and decreased blood viscosity.
 - If marked increase, indicates moderate to severe anemia and Further evaluation by fetal blood sampling.

4.Amniocentesis

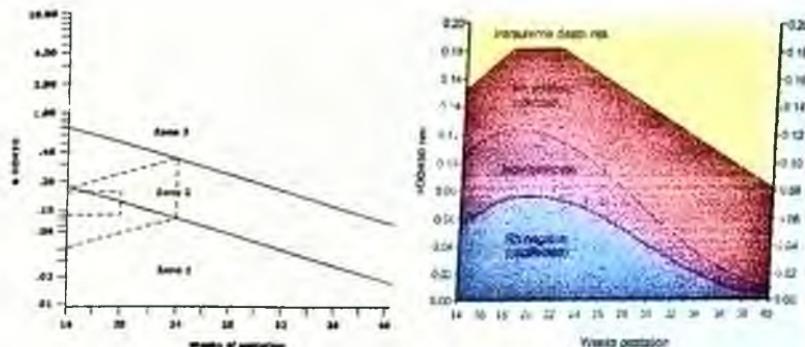
- Indications: Antibody titer is $> 1/32$ (> 4 IU/ml).
- Technique: 5-10 ml of AF are kept in a brown bottle to protect it from exposure to the sunlight, then AF is analyzed by spectrophotometer.
- Interpretation:
 - a) The optical density (OD) between 350 and 650 nm form a straight line.
 - b) If amniotic fluid contains bilirubin, the OD readings will show a peak at 450nm.
 - c) Results are plotted on semi-logarithmic paper to measure the delta OD₄₅₀.

Liley (1964) constructed a graph (*Liley's curve*) for prediction of the severity:

Zone 1 indicates unaffected fetus, or mild disease, or a D negative fetus.

Zone 2 the fetus is at moderate to severe risk.

Zone 3 indicates severely affected fetus & expected death within 7-10days



Liley's curve

5-Cordocentesis

- It allows measurement of the fetal hematocrit and hemoglobin concentration and so it determines the severity of the hemolytic process.
- Indications: if there is a high likelihood that the fetus is anemic and would require treatment by MCA PSV or amniocentesis.
- Disadvantages
 - Feto-maternal bleeding
 - Thrombosis of umbilical vessels.
 - Risk of fetal death 1.5%.
- If hematocrit < 30%, fetal blood transfusion is needed.

6- Fetal blood transfusion:

Injection of packed R.B.Cs Rh -ve group O. either intraperitoneal guided by ultrasound or intravascular into umbilical circulation (in severely affected immature fetus < 34 weeks) may be repeated every 3 weeks in severely affected immature fetus till 34 weeks, then delivery and exchange transfusion.

Termination of pregnancy:

- Timing; after lung maturation by L/S ratio (zone I, II) OR 35 weeks' gestation (zone III).
- Mode of termination: vaginal or C.S according to obstetric indications.
- Management at time of delivery:
 - Usual management + avoid milking of the cord (immediate clamping).
 - Taking sample of the cord blood,
 - The cord is clamped 3 inches from the umbilicus to allow sufficient cord length for exchange transfusion.

Management of the infant after delivery:

- Phototherapy: as ultraviolet rays help oxidation of bilirubin.
- Phenobarbital: helps conjugation of bilirubin by the liver enzymes.
- Exchange transfusion:

It is indicated in cases of:

- a) History of previously markedly affected fetus,
- b) Cases with +ve direct Coombs with (cord Hb < 15 gm. % or cord bilirubin > 5mg %)
- c) Cases with rapidly rising bilirubin level after delivery
- d) Premature infants
- e) High level of maternal antibodies

ABO allo-immunization

- ABO incompatibility between fetal and maternal blood present with 5% clinically significant.
- Maternal anti A or anti B antibodies normally is of IgM type (Not cross the placenta).
- Only in sometimes it is IgG and can cross the placenta, causing mild type of hemolytic disease (Dilution to the antibody effect).
- The hemolysis can affect 1st baby (WHY? As it does not need initial sensitization),
- Mild affection and recurrence may occur,
- It is managed as mild cases of Rh disease (no need for amniocentesis)
- Rarely is it severe to cause neonatal jaundice in the first 48 hours requiring exchange transfusion

Treatment

No obstetric management

Postnatal management

- Anemia can be corrected by blood transfusion.
- Hyper-bilirubinemia and jaundice occur because in utero the mother cleared this red blood cell breakdown product but the immature neonatal liver is unable to cope (this usually needs phototherapy but may require exchange transfusion).
- Antibodies may persist for weeks causing continued hemolysis in the neonate; this requires careful monitoring with hematocrit measurements.

Fetal infections

LEARNING OBJECTIVES:

- To list the most common infections that may affect the fetus
- To understand the impact of infections on the fetal survival and development of congenital malformations
- To study methods of diagnosis of fetal infections

Rubella (German measles)

Symptoms

- Mild, febrile illness.
- Maculopapular rash.
- Arthralgia and Lymphadenopathy.

Fetal risk:

Rubella-associated congenital defects:

- Deafness.
- Cardiac abnormalities including VSD, PDA.
- Eye lesions (congenital cataracts, microphthalmia, and glaucoma).
- Microcephaly and mental retardation

Diagnosis

Requires serological confirmation with paired samples. Recent infection is confirmed by:

- Appearance of IgM antibodies .
- \geq Fourfold ↑ in IgG antibody titers.

Prevention: (vaccination)

The vaccine is a live attenuated virus and therefore contraindicated in pregnancy and pregnancy is avoided for 12 weeks after vaccination.

Management: (according to GA)

Gestation	Risk of transmission	Risk of congenital abnormality	Treatment
< 13 weeks	80%	Almost all infected fetuses	TOP may be offered without invasive prenatal diagnosis
13-16 weeks	50%	About 35% of those infected (mainly deafness)	Fetal blood sampling may be later offered to confirm infection
>16 weeks	25%	Rarely causes defects	Reassurance

Cytomegalovirus (CMV)

Symptoms

Infection is asymptomatic in 95% of cases but it may present with:

- Fever
- Malaise.
- Lymphadenopathy and atypical lymphocytosis

Fetal risk:

- IUGR
- Microcephaly
- Hepatosplenomegaly and thrombocytopenia.
- Jaundice
- Chorioretinitis

Diagnosis

Maternal infection

Usually requires serological confirmation with recent infection is confirmed by:

- Significant ↑ in IgM antibodies (may persist for up to 8 months).
- ↑ IgG antibody titers
- Culture /PCR of maternal urine (not widely available).

Fetal infection

- culture / PCR of amniotic fluid (after 20 weeks)
- ultrasound for fetal anomalies.

Management

- As most fetuses will be unaffected, counseling about management (including TOP) is very difficult even in the face of confirmed fetal infection. However, close monitoring of fetal growth and well – being is clearly indicated, with appropriate pediatric follow up
- Breast-feeding is contra-indicated in active infection.

Varicella (chickenpox)

Symptoms

- Fever.
- Malaise.
- Maculopapular rash which becomes vesicular then crusts over.

Fetal risks

Fetal infection rate is thought to be ~25% in all trimesters: if <20 weeks there is a 2% risk of fetal varicella syndrome with congenital defects including.

- Skin scarring.
- Limb hypoplasia.
- Eye lesions (congenital cataracts, microphthalmia, and chorioretinitis).
- Neurological abnormalities (mental retardation, microcephaly, cortical atrophy, and dysfunction of bladder and bowel sphincters).

Diagnosis & Management

- Diagnosis of varicella itself is usually made on the history of contact and appearance of the typical rash.
- If significant contact with potentially infected individual, serum should be tested for VZV IgG antibodies.
 - If antibodies are detected within 10 days of contact, immunity can be assumed and reassurance given.
 - If not, varicella immunoglobulin (VZIG) should be given as soon as possible

According to GA

Gestation	Risk to fetus	Management
< 20 weeks	2% will develop fetal varicella syndrome (FVS)	Detailed ultrasound examination at 16-20 weeks. may consider TOP if evidence of FS seen. Neonatal ophthalmic examination
>20 weeks	Not associated with congenital abnormality	Fetal and neonatal surveillance

Parvovirus B19

Symptoms

- Often asymptomatic
- Typical 'slapped cheek rash'
- Fever
- Arthralgia.

Diagnosis

Diagnosis requires serological confirmation. Recent infection is confirmed by

- Appearance of IgM antibodies
- ↑ IgG antibodies

Fetal risks

- Suppression of erythropoiesis resulting in
- Cardiac failure and non-immune hydrops

Management

- Serial ultrasound scans, measuring the peak systolic velocity of the fetal middle cerebral artery, are required to monitor for anaemia
- In utero blood transfusion may be possible to prevent fetal demise in severely anaemic.

Toxoplasmosis

Symptoms

- Asymptomatic in about 80% of cases. May present with
- Fever.
- Lymphadenopathy

Fetal risks

- Spontaneous miscarriage is common with infection in the first trimester.
- Defects associated with primary infection include
 - a) Chorioretinitis.
 - b) Microcephaly and hydrocephalus.
 - c) Intracranial calcification.
 - d) Mental retardation.

Diagnosis

Maternal infection

- Requires serological confirmation.
- Recent infection is confirmed by:

- a) Isolated very high titers of IgM antibodies (may persist for up to 1 year).
- b) Concurrent high IgM and IgG antibodies.
- c) Fourfold ↑ IgG antibodies.

Fetal infection

- May be diagnosed by the presence of IgM antibodies in amniotic fluid or fetal blood.
- Amniocentesis is accurate only after 20 weeks.
- Although ultra-sound signs such as cerebral ventriculo-megaly can ventriculomegaly can occur most affected fetuses have a normal scan.

Management

Starting spiramycin on diagnosis of maternal infection may decrease the risk of fetal infection. Neonatal follow-up should include an ophthalmic review and cranial radiological studies.

Group B streptococcus (GBS)

Symptoms

None.

Diagnosis

Culture from a lower vaginal and perianal swab.

Fetal risks

Associated with preterm prelabor rupture of membranes and preterm delivery

Neonatal risks

- Most frequent cause of early onset, severe neonatal infection .
- Early -onset GBS infection (<4 days from delivery) may present with:
 - a) Pneumonia.
 - b) Septicemia.
 - c) Meningitis.
- Late- onset infection (>7days) will have serious neurological sequelae such as cortical blindness and deafness.

Management

Intrapartum prophylaxis should be considered in case of:

- Prematurity (<37weeks)
- Prolonged rupture of membranes (>18hours).
- Pyrexia in labor.

Antibiotics

The recommended prophylaxis in labor is IV benzyl penicillin& In case of penicillin allergy, IV clindamycin should be used .

Normal and abnormal puerperium

LEARNING OBJECTIVES:

- To define correctly the period of puerperium
- To describe change in the genital organs, breasts and general condition during puerperium
- To list causes of puerperal pyrexia and risk factors associated with puerperal sepsis
- To state symptoms and signs of puerperal sepsis and describe its management
- To describe the time and frequency of postnatal visits and the time of initiation of contraception

Puerperium

Definition:

The period immediately following labor or abortion during which involution of the genital organs occur, about 6 weeks following delivery 2-4 following abortion

Physiological changes:

Uterus

Placental site

- Rapid decrease in volume of the uterine cavity after delivery separation of placenta
- Contraction of myometrial muscle fibers
- Compression of the vessels of the placental bed which lead to mechanical hemostasis.

Endometrium

- Shedding of the decidua of pregnancy occurs with the postpartum loss (lochia).
- By the 3rd week, regenerating endometrium covers the decidua site.

Uterine size and weight

- Immediately after delivery the fundus is located at the level of umbilicus.
- At one week fundus felt midway between umbilicus and the symphysis.
- At 2 weeks fundus may still be palpable abdominally.
- By 6 weeks return to non-pregnant size.

Vagina

- Vaginal epithelium resumes its rugae by approximately 2-3 weeks.

Ovarian function and menstruation

- It recurs within 6-8 weeks in non-lactating women but in lactating varies.
- During lactation → lactational amenorrhea.
- In non-lactating patients ovulation can occur as early as 4 weeks postpartum.

Breasts

- Colostrum appears during 1st 3 days.
- Established milk secretion occurs after that.

Cardiovascular and coagulation changes

- The puerperium is associated with an increased risk of thromboembolism.
- Risk of DVT and pulmonary embolism in prolonged deliveries, CS and obese women.

Puerperal pyrexia

Definition (no standard definition):

- It is a rise of temperature reaching 38°C or more and lasting for 24 hours or more during the first 3 weeks of puerperium.
- Some define it as a rise of temperature to reach 38°C or above measured twice during the first 10 days of puerperium excluding the 1st 24 hours.

Causes:

1- Genital:

- Puerperal sepsis should be considered in each case till proved otherwise.

2- Non-Genital

- Breast, engorgement (most common), mastitis and breast abscess.
- Renal system.
- Abdomen and pelvis: wound infection, missed towel, pelvic abscess.
- Respiratory system: bronchitis, pneumonia, tonsillitis, influenza.
- Lower limbs: DVT and pulmonary embolism.
- General: Dehydration and collagen disease.

Treatment:

It is the treatment of the cause.

Puerperal sepsis

Definition:

It is a genital tract infection resulted from bacterial invasion during or after labor.

Causative organism:

- Usually mixed aerobic and anaerobic organisms, ascending from lower genital tract.

▪ Anaerobic organisms:

- a) (e.g. anaerobic streptococci, clostridia tetani)

- b) These are the commonest organisms which are normally nonpathogenic but become so in the presence of blood and devitalized tissue.

▪ Aerobic organisms.

- a) (e.g., streptococci group B and A, staphylococci, pneumococci)

- b) As chlamydia and mycoplasma.

Predisposing factors

- General factors: anemia, DM, malnutrition and chronic diseases
- Local factors: as prolonged labor, PROM, instrumental delivery, retained placenta.
- Negligence of aseptic technique.

Route of infection:

- Ascending: (exogenous and endogenous) from the lower genital tract flora.
- Hematogenous: via blood stream from a distal septic focus.

Sites of infection and pathology:

1) Primary sites:

- Wound infection at the placental site or lower genital tract.
- Lacerations of the vulva, vagina or cervix
- Uterus: Placental site, retained placental tissue or membranes.
 - Putrid endometritis (localized type):
 - It is a mild type due to low virulent organism and good patient resistance.
 - The uterus is subinvolved (large and flabby).
 - The uterine cavity contains large amount of foul necrotic tissue and pus.
 - The muscle next to the endometrium contains a leucocytic barrier and this limits spread of infection.
 - Septic endometritis (generalized type):
 - It is a severe type due to a virulent organisms as hemolytic streptococci.
 - The uterus is involuted.
 - The uterine cavity is lined by pyogenic membrane.
 - The leucocytic barrier is lacking and this favors spread of infection.
 - The lochia is scanty and not offensive.

2) Secondary sites: Usually occur as an extension from the primary sites via:

- Pelvic spread: Acute PID, parametritis, pelvic abscess.
- Blood spread (venous spread): may leads to bacteremia, septicemia or pyemia.
- Right sided infection via IVC. It may be complicated by lung abscess
- Left sided infection via left renal vein. It may be complicated by pre-renal abscess

Diagnosis

History of risk factors

Clinical picture: (depends on the pathological type)

Symptoms:

- Pain:
 - Suprapubic or pelvic pain.
 - Generalized abdominal pain and tenderness in generalized peritonitis.
 - Pain in the lower limbs in cases of DVT

- Discharge: In putrid endometritis, the lochia is excessive and offensive.
- Bleeding i.e. secondary postpartum hemorrhage.
- Fever, headache and malaise.
- Vomiting: Vomiting is continuous if generalized peritonitis develops.
- Diarrhea and rectal tenesmus in localized peritonitis i.e. pelvic abscess.

Examination:

- General examination:
 - Fever and tachycardia
 - Dehydration in case of generalized peritonitis due to paralytic ileus
 - In cases of septicemia:
- a) Rigors
- b) Tachycardia out of proportion to the fever
- c) Flushed, warm and dry skin
- d) Jaundice, cyanosis and purpura.
- Abdominal and vaginal examination:
 - Infected laceration:
- a) The wound is red, hot, painful and swollen.
- b) It shows greenish yellow discharge.
 - Puerperal endometritis:
 - Putrid endometritis:
- c) The onset is 4 days after delivery.
- d) The uterus is subinvolved and tender.
- e) The lochia is excessive and offensive.
 - Septic endometritis:
- f) It occurs 1-3 days after labor
- g) The uterus is involved, tender
- h) The lochia is scanty.
 - Parametritis:
- i) The onset is 7-10 days after delivery.
- j) It produces indurated tender mass lateral to the uterus.
- k) Parametric abscess is suspected by softening of the mass and the temperature becomes hectic.
 - Salpingo-oophoritis:
- l) The onset is 7-10 days after delivery.
- m) Bilateral tenderness but rigidity is not marked due to laxity of the abdominal muscles resulting from pregnancy
- n) Pain on moving of the cervix.
 - Thrombophlebitis
- o) Onset is 7-10 days after delivery

p) If the thrombus extends to the femoral vein the whole limb becomes swollen, bluish and painful

- Peritonitis:

Generalized peritonitis:

q) Generalized abdominal pain

r) Fever and tachycardia.

s) Continuous vomiting

t) Dehydration.

Pelvic abscess:

u) Pelvic pain and tenderness

v) Fever and tachycardia.

w) Diarrhea and tenesmus

x) Tender fluctuant mass in Douglas pouch.

Investigations

- CBC leucocytosis.
- Blood culture (during febrile time) on aerobic and anaerobic cultures.
- Ultrasonography: retained parts, subinvolution and pelvic abscess.
- Investigations for complications, when suspected.

Complications

Early complications

- Spread to 2ry sites e.g., pelvic abscess.
- Complications of septicemia and pyemia.

Remote complications

- Infertility
- Asherman's syndrome.
- Ectopic pregnancy.
- Sheehan's syndrome

Treatment

Prophylactic

- Good antenatal, intranatal and postnatal care.

Active treatment

General Lines

- Bed rest, high nutritive diet, liberal fluid, analgesics and antipyretics

Antibiotics

- Start by triple antibiotics to cover mixed infection.

- If clostridium welchii is suspected, anti-gas gangrene serum is given.

Fowler's position for adequate drainage

Ecbolic are given to maintain uterine contraction and avoid subinvolution.

Specific lines:

- Infected episiotomy or tear → use local antibiotic spray.
- Retained parts of placenta or membranes → EUA, suction and evacuation.
- Tubo-ovarian and pelvic abscess → see gynecology.
- Pelvic thrombophlebitis → heparin or low molecular weight heparin.
- Management of septicemia or septic shock by admission to intensive care units.
- Treatment of any other complications as DIC or renal failure.

Instrumental delivery

LEARNING OBJECTIVES:

- To list the different indications of low forceps and ventouse in modern obstetrics
- To recognise the different types of obstetric forceps and ventouse and their different applications
- To enumerate the conditions to be fulfilled before forceps application
- To describe the technique of application of forceps and ventouse
- To list the possible complications of instrumental delivery

Forceps delivery

Types of forceps delivery

Forceps



Vacuum extraction



- Forceps delivery has been divided into outlet, low and midforceps
- Only outlet and low forceps are commonly used in routine practice
- Midforceps is substituted by either vacuum extraction or CS

Outlet forceps

- Fetal scalp is visible at the introitus without separating the labia
- Fetal skull reaches the pelvic floor
- Sagittal suture is in the antero-posterior diameter or occupying one of the oblique diameters
- Fetal head is at or on the perineum
- Rotation does not exceed 45°

Low forceps

- Leading point of the fetal skull is at least 2 cm below the ischial spines
- Rotation does not exceed 45°

N.B High and midforceps deliveries have no place in modern obstetrics.

Indications of forceps delivery

Maternal indications

- To shorten the second stage of labor, e.g., maternal distress or maternal disease such as cardiac disease.
- Prolonged second stage of labor

Fetal indications

- Fetal distress
- Fetal malposition and malpresentation e.g., occiput-posterior positions

Special indications

- After-coming head in a breech presentation
- Difficulty of extraction of the head during CS (one blade is used as LEVER action)

Prerequisites for applying the forceps

- Fully dilated cervix.
- Empty the bladder.
- Artificial rupture of the membranes (ARM).
- Anesthesia e.g., pudenda nerve block for outlet forceps and regional or general anesthesia for low forceps.
- Confirm position and station.
- Engaged head
- Suitable presentation e.g. vertex, face (mentoanterior) and the after-coming head in a breech presentation.
- Suitable position: the sagittal suture is in the antero-posterior diameter or occupying one of the oblique diameters, i.e., rotation should not exceed 45°

Rule out C PD if:

- Absence of a large caput succedaneum or 3+ molding.
- Clinical pelvimetry (wide subpubic angle that accommodates at least two fingers and the distance between the two ischial tuberosities accommodates a closed-hand fist).
- Presenting part descends with contractions.

Contraindications of forceps operation

- Absence of one or more of the requirements needed for forceps application.
- Operator inexperience (lack of proper training).
- Inability to achieve proper application of the instrument.

Technique of forceps delivery

- Apply forceps
- Introduce the left blade held by the left hand and guided by two fingers of the right hand.
- Apply the right blade of the forceps guided by the left hand to rest on the other side of the head

- Depress the handle and lock the forceps.

Correct instrument application:

- Blades lock easily together.
- The sagittal suture is in the middle line between the blades.
- Apply a steady traction downward and backward with the uterine contraction.
- Monitor head descent with contraction until the perineum begins to bulge (usually it takes 2-3 pulls to deliver the head).
- Perform an episiotomy when the head crowns.
- Elevate your hands upward until the head is delivered.
- Remove blades and complete delivery of the neonate.

Complications of forceps delivery

Maternal

- Severe perineal lacerations.
- Episiotomy extension is more common with a forceps delivery than with a vacuum extraction.
- Pelvic floor dysfunction (e.g., prolapse, urinary stress and anal incontinence).

Fetal

- Intracranial hemorrhage and fractures of the skull.
- Nerve injury, e.g., facial nerve injury that results in Bell's palsy.
- Cephalhematoma.
- Injury to scalp, face or eyes.

If failed forceps

- Stop efforts to deliver vaginally by forceps.
- Do not apply sequential use of vacuum extraction after failed forceps.
- C.S

Vacuum extractor (Ventouse)

Types of vacuum extractors

- Soft cups and rigid cups: The use of soft vacuum extractor cup is associated with more delivery failure rates.



Soft cups



Rigid cups

- Electrical or mechanical (manual) vacuum pumps.

Indications of vacuum extraction

- Arrested or prolonged second stage of labor.
- Arrest of rotation in occipitoposterior positions.
- Fetal distress.
- Maternal exhaustion, e.g., cardiac failure, severe pre-eclampsia.

Prerequisites for applying the vacuum extractor

- Vertex presentation only.
- Near term pregnancy: 36 weeks' gestation.
- Fully dilated cervix.
- Engaged head, i.e., the head is at station 0 or more by vaginal examination and/or 2/5 of the head or less are felt above the symphysis pubis.
- CPD ruled out.
- Ruptured membranes.
- The urinary bladder and rectum must be empty.

Contraindications for vacuum extraction

- Any malpresentation, e.g. face presentation
- Prematurity: < 36 weeks' gestation
- Before full cervical dilation
- Exceptions: in a multipara with prolapsed cord and the cervix is 9 cm dilated or after the delivery of the first twin when the cervix is starting to reform
- Inability to determine fetal position.

Technique of vacuum extraction

- Assess the position of the fetal head by identifying the sagittal suture and the posterior fontanelle.
- Apply the largest cup that can be easily introduced into the vagina.
- Place the cup over the sagittal suture 1-2 cm in front of the posterior fontanelle (flexion point).
- Traction after proper cup placement will promote flexion, descent and autorotation.
- Create negative pressure to 0.2 kg/cm².
- Palpate the whole circumference of the cup to avoid entrapped maternal tissue, which may lead to laceration and cup detachment.
- Increase the negative pressure to a maximum of 0.8 kg/cm².
- Start traction with uterine contractions and voluntary pushing.
- Intermittent traction should be in the direction of the axis of the pelvis and perpendicular to the plane of the cup.
- Support the cup during traction with two fingers of the other hand to prevent cup detachment.
- Perform an episiotomy when needed.



Vacuum extraction

Vacuum extraction failure (F):

- No progress in head descent with each traction
- The vacuum cup detached twice at maximum negative pressure with traction in the proper direction.
- Failure of delivery of the fetus after 20 minutes in the presence of efficient uterine contractions and good maternal efforts.

*Perform a CS i.e NO forceps delivery following a failed vacuum extraction.

Complications of vacuum extraction

- Fetal
 - a) Scalp lacerations, bruises, abrasions, blisters and cephalo hematoma.
 - b) Intracranial hemorrhage and skull fractures.
 - c) Neonatal jaundice from hyperbilirubinemia.
 - d) Brachial plexus injury; Erb's palsy.
- Maternal
 - a) Genital tract injuries, e.g., vaginal or cervical lacerations
 - b) Pelvic floor dysfunction.

Cesarean section

LEARNING OBJECTIVES:

- *To list the different indications of cesarean section*
- *To recognize the technique of the different types of cesarean section*
- *To state the complications of cesarean section*
- *To enumerate the advantages of lower segment cesarean section over upper segment one.*
- *To enumerate the indications of cesarean hysterectomy.*

Definition

An operative procedure to deliver the fetus through incisions in the abdominal and uterine walls

Indications for cesarean section

- Maternal
 - CPD.
 - Failure of labor to progress, with partograph monitoring.
 - Previous two or more cesarean deliveries.
 - APH.
 - Soft tissue obstruction.
 - Failed induction of labor.
 - Prior surgery on the uterine fundus (e.g., upper segment CS or myomectomy in which the uterine cavity was opened).
- Fetal
 - Persistent fetal distress.
 - Malpresentation.
 - Post maturity, if there is fetal distress with induction of labor.
 - Multiple pregnancy.
 - Prolapsed pulsating cord.

Preparation for cesarean delivery

- Obtain informed consent for the procedure.
- Assist the woman and her family to prepare emotionally and psychologically for the procedure.
- Clip the pubic hair with scissors to reduce skin cuts and wound infection.
- Give an antacid to reduce stomach acid in case there is aspiration
- In an elective CS, keeps the patient fasting from the night before.
- Insert a Foley catheter into the bladder and monitor output and clarity of urine.
- Use prophylactic anticoagulation (5000 IU heparin SC) one-half hour before CS in patients with multiple risk factors for clot formation
- Check fetal heart sounds just before surgery.

Technique of cesarean section

- Place the woman in a tilted position to the left or place a pillow under her right lower back to decrease the chance of supine hypotension syndrome
- Apply antiseptic solution to the incision site using a sterile ring forceps and cotton or gauze swab.
- Open the anterior abdominal wall by Transverse, Pfannestiel incision (which is more commonly used currently) This incision is done by a transverse supra pubic incision of the skin and sub cutaneous tissue by a scalpel and separated to the level of the anterior rectus sheath.



Two small incisions are made transversely in the rectus

Uterine incision

- The anterior rectus sheath is separated from the recti muscles and cut by scissors.
- The two recti are separated and the peritoneum is incised vertically.
- Pack the lateral pouches with two abdominal towels to minimize soiling of the general peritoneal cavity
- Incise the uterus.

A- Lower transverse uterine incision (lower segment CS):

- Grasp and divide the loose peritoneum covering the lower uterine segment.
- Dissect the lower peritoneal flap and bladder downward and apply a retractor to hold them back.
- Open carefully a small transverse incision in the lower uterine segment using a scalpel Care should be taken to avoid fetal injury.
- Extend the incision laterally and slightly upward by a pair of curved scissors or bluntly by the index fingers of both hands.
- Care should be taken to avoid injury to the uterine vessels

B - Upper segment CS:

- A sub-umbilical abdominal wall incision is used to access the abdominal cavity.
- A midline longitudinal uterine incision is made in the upper uterine segment.
- Indications for upper segment CS
 - Macrosomic malformed fetus.
 - Contracture ring.
 - Vascular lower segment.
 - Extensive adhesions to the bladder.
 - Neglected shoulder.
 - A fibromyoma that prevents the access to the lower uterine segment.
- Disadvantages of upper segment CS The patient has to deliver by elective lower segment CS thereafter because of the unacceptably higher rate of ruptured uterus.
- Delivery of the fetus

- The placental membranes are then ruptured and continuous suction of amniotic fluid and blood is done.
- Flex the fetal head with your hand and bring the occiput into the incision line (in cephalic presentation).
- Exert fundal pressure by the assistant to facilitate the expulsion of the head.
- Clear the mouth and nose with a suction catheter and complete the delivery of the neonate.
- Clamp and cut the cord.
- Deliver the placenta by gentle traction on the umbilical cord and elevation of the uterine fundus.

(Routine manual separation of the placenta during CS is accompanied by increased blood loss and increased rate of infection).

- Wipe the uterine cavity with a towel to remove any remnants and hold the uterine edges with *Allis* or *Green Armytage forceps*.
- Close the uterus in one or two layers and ensure hemostasis.
- Close the visceral peritoneum.
- Remove abdominal towels and confirm with the nurse that their count is correct.
- Inspect both adnexa for any incidental pathology e.g. dermoid cyst in the ovary.
- Close the anterior abdominal wall in layers.

Common difficulties encountered during CS:

- In repeat CS operations, three problems may occur:
 - Rupture of the previous scar
 - Adherent placenta
 - Presence of dense adhesions that increase the risk of bladder or bowel injury.
- Uterine vessel injury from extension of the uterine incision: can be prevented by using a C-shaped or a lower vertical incision rather than a transverse incision in cases of fetal macrosomia or the lower uterine segment is not yet formed.
- If the head is deeply engaged, assistant wearing sterile gloves may push the fetal head vaginally toward the incision. The surgeon assists from above by upward pressure on the anterior shoulder.
- If there is a difficulty in delivering a high head, apply fundal pressure or extract the head using forceps.

Vaginal birth after cesarean section (VBAC)

Trial of scar

- The majority of women who have had a prior cesarean delivery are acceptable candidates for subsequent trial of labor.
- The patient should be counseled about the benefits and risks of trial of scar.

Patient inclusion criteria for trial of scar

The dictum is once CS, always hospital delivery and 2 or more CS equal CS

- One previous lower segment CS
- Clinically adequate pelvis
- No other uterine scars or previous rupture
- Recurrent indication for abdominal delivery not present

Other inclusion criteria

- A physician is immediately available in the labor ward and is capable of detecting early signs of uterine dehiscence (e.g., abdominal tenderness, vaginal bleeding, and fetal heart rate deceleration).
- The hospital set up allows for performing a CS delivery within 15-20 minute. This includes the availability of an anesthesiologist, neonatologist, active blood banking services and an operating room that can be ready within a short time.

Contraindications for trial of scar

- Two or more previous lower segment CS operations.
- Classical upper segment CS.
- Prior CS incision that necessitated an upward extension into the upper segment (inverted T incision).
- Presence of malpresentation.
- Placenta previa or abruptio placentae.
- Marked fetopelvic disproportion.

Elective cesarean section

- Elective CS is a well-prepared and rather safe procedure.
- The patient is kept fasting and proper preoperative preparation is done.
- The neonatologist is informed ahead of time.
- The operation is scheduled in the morning list when senior expert supervision is available.
- Although elective CS appears to be the safest type of procedure, two points should be emphasized:
 - I- Gestational age should be confirmed by early ultrasound in order to avoid delivery of a preterm neonate.
 - 2- If the gestational age is unknown, the patient can wait until early labor pains start.
- Care has to be taken during opening the uterus, as the operation is done prior to the onset of labor and the lower segment may not yet be formed.

Disadvantages of elective CS

- Prematurity
- Lochiametra
- Atonic PPH

Indications of cesarean hysterectomy:

Emergency

- Uncontrolled hemorrhage: Uterine atony
- Abruptio placentae with coagulopathy and adherent placenta
- Extensive cervical laceration
- Extensive infection
- Uterine rupture not amenable for surgical repair

Non-emergency

- Symptomatic fibroids or endometriosis
- Grade III cervical intra-epithelial neoplasia (CIN)
- Invasive cervical carcinoma (radical cesarean hysterectomy)

Episiotomy

Definition An operation in which the perineum is cut during labor.

Indications

A- Maternal

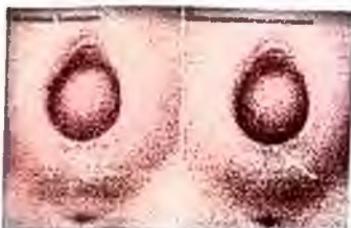
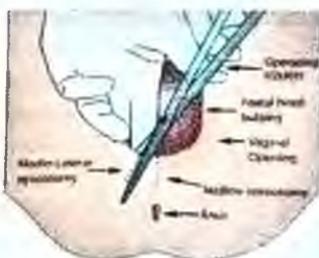
- Primigravida
- Scarred perineum
- Before operative delivery
- Mild outlet contraction
- Intrauterine manipulations

B- Fetal

- Preterm labor
- Large head
- Breech presentation
- D.O.P position

Advantages

- Avoid irregular perineal tears.
- Avoid overstressing of the perineum and subsequent prolapse.
- Shorten second stage of labor.
- Minimize sudden head compression and decompression.



Types

i. Median episiotomy

- Incision in the midline of the perineum.

It divides the following structures

- Vaginal mucosa and fourchette.
- Skin and fascia.
- Perineal body.
- Advantages:
- Easy, Repair is easy and anatomical, less bleeding.
- Disadvantages: May extend to the anal sphincter

ii. Mediolateral episiotomy-

Types of episiotomy

- Incision starts at the fourchette and extends towards the ischial tuberosity.

It divides the following structures:

- Vaginal mucosa and fourchette.
- Skin and fascia.
- Superficial and deep transverse perinii.
- Bulbocavernosus and Pubovaginalis muscles.

Advantage: Avoid extension to the anal sphincter.

Disadvantages: More difficult, Not anatomical. more bleeding and more painful scar.

Operative technique

- Lithotomy position and asepsis.
- Local infiltration anesthesia.
- At crowning, incision is done.
- Repair using chromic catgut or vicryl 2/0.
- Wound care : Antiseptic vaginal solution and the wound is kept clean and dry

Induction of labor

LEARNING OBJECTIVE:

- To list the different indications for induction of labor.
- To describe the different techniques of induction of labor.
- To rerecognize favorability for induction of labor with special emphasis of Bishop's score
- To state the complications of induction of labor and drugs used in it.

Definition

The artificial initiation of uterine contractions prior to their spontaneous onset

Indications

- Induction of labor is indicated when the benefits to the mother or fetus outweigh those of continuing the pregnancy.

Maternal indications

- Pre-eclampsia and eclampsia.
- DM.
- Post-term pregnancy.

Fetal indications

- IUGR
- IUFD.
- PROM.
- Fetus with congenital anomalies incompatible with life, e.g., anencephaly.

Contraindications

Maternal contraindications

- Contracted pelvis.
- Selected medical conditions such as active genital herpes.
- Uterine contraindications.
- Previous uterine surgery (induction may be tried in cases with one lower segment CS).
- Placenta previa.

Fetal contraindications

- Fetal macrosomia.
- Transverse or oblique lie of the fetus.
- Some fetal anomalies such as hydrocephalus.
- Non-reassuring fetal status.

Selection of the induction method

Factors which affect the choice of the induction method include:

- Parity (Multipara are more sensitive to stimulatory drugs).

- The state of the cervix on vaginal examination.
- The state of the membranes (Women with ruptured membrane respond differently to stimulatory drugs than those intact membranes).
- The presence of a uterine scar.

(A) Non-pharmacological methods

1- Amniotomy (Artificial ROM).

- Amniotomy may be used alone or with drugs such as oxytocin or prostaglandins.
- It allows for detection of meconium.
- The main disadvantage of amniotomy when used alone for labor induction is the unpredictable and occasionally long interval until the onset of contractions.



2- Membrane stripping:

- Prior to formal induction of labor, women should be offered stripping of the membranes
- Membrane stripping is not associated with an increase in maternal or neonatal infection
- Membrane stripping is associated with increased levels of discomfort during the examination and bleeding

3- Catheters and balloons

- Catheter is introduced just above the level of the internal cervical os and the balloon distended with 30-50 mL of a sterile isotonic saline.
- Once adequate dilation occurs, the balloon will pass through The cervix
- Induction can be completed by amniotomy and/or oxytocin.

(C) Pharmacological methods

1 Oxytocin:

2. Prostaglandins

- Prostaglandins are more effective than oxytocin with lower rate of operative delivery.
- Routes of administration
 - a) Intravenous,
 - b) oral,
 - c) intracervical and
 - d) intravaginal

- Dosage
 - a) Prostin E2 vaginal tablet (the most commonly used route).
 - b) Insert one Prostin E2 vaginal tablet (3 mg dinoprostone) high into the posterior fornix, followed after 6-8 hours by another tablet if labor is not established (maximum dose is 6 mg).
 - c) The woman should remain recumbent for at least 30 minutes following application.

NB:

- a) Observe the fetal heart rate and uterine contractions closely.
- b) Do not give oxytocin before 6 hours from the time of Prostin E2 insertion.
- c) Be very cautious regarding the use of prostaglandins in the presence of
- d) borderline CPD (avoid if significant),
- e) women with a history of lower uterine segment CS,
- f) women of high parity,
- g) women with breech presentation,
- h) Patients with history of asthma, hypertension, hepatic or renal insufficiency with glaucoma.

Contraindications

- a) Active cardiac or pulmonary disease
- b) Active renal or hepatic disease

Side effects

- Gastrointestinal troubles (nausea, vomiting and diarrhea)
- Maternal hypertension.
- Bronchospasm.
- Uterine hyperstimulation which may lead to uterine rupture.
- Fetal distress.
- Abruptio placentae.
- Fever.

Complications of induction of labor:

- 1- Failed induction
 - a. More in nulliparas with an unfavorable cervix at the time of induction
 - b. Rare in multiparas, except in patients whose only previous delivery was by CS.
- 2- Uterine hyperstimulation
 - a. If six or more contractions in 10 minutes for a total of 20 minutes.
 - b. It may lead to fetal distress or even death
 - c. It may also lead to uterine rupture

3- Management

- Stop oxytocin.
- Place the patient on her left side.
- Tocolysis should be given.
- Oxygen therapy in cases of fetal compromise.
- Allow labor to continue if normal uterine contractility and FHR are reassuring.

4- Hyponatremia and water intoxication

- a. Hyponatremia occur if prolonged infusions of high doses of oxytocin in dextrose or dilute solutions of saline.
- b. Maternal fluid retention (water intoxication), electrolyte disturbances, convulsions, coma and death.

5- Neonatal hyperbilirubinemia

Incidence of neonatal hyperbilirubinemia increases following IV oxytocin administration.

6- Cord prolapse

- a. Occur with amniotomy if the presenting part is high and with complete breech.

7- Abruptio-placentae

- a. Following amniotomy, especially in cases of hydramnios.
- b. Increased incidence of chorioamnionitis.
- c. May occur if membranes have been ruptured for over 96 hours.

8- Increased incidence of CS. Due to

- a. Failed induction.
- b. Increased incidence of fetal distress.
- c. Increased incidence of cord prolapse.
- d. Increased incidence of abruptio-placentae.

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